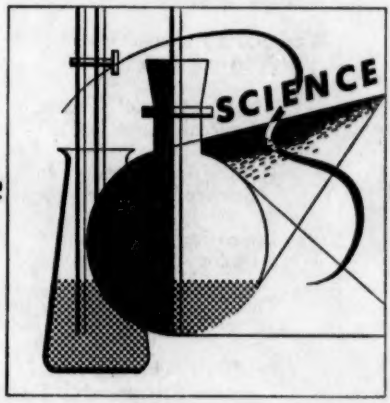
# CALIFORNIA JOURNAL OF SECONDARY EDUCATION

170 SOUTH VAN NESS AVENUE, SAN FRANCISCO, CALIFORNIA

Vol. 23, No. 4 April, 1948




IN THIS ISSUE

## CURRICULUM PROBLEMS IN THE TEACHING OF SCIENCE

The editorial and the first article in this symposium are contributed by Cornelius H. Siemens, Director, Compton College. Also writing on science education are Leo F. Hadsall, Professor of Biology, Fresno State College; Adrian Gentry, Instructor in Biology, San Diego State College; Wayne A. Durston, Instructor in Science, El Camino Junior College; Willard Geer, Assistant Professor of Physics, University of Southern California; B. Frank Gillette, Director of Student Teaching and Specialist in Science Education, Stanford University; and Ruth Maguire, Research Assistant, California State Department of Education and Stanford University.

Articles of general interest include a report on California's needs in higher education, by George S. Strayer, Columbia University; a study of the success of students admitted to the University of California through University Extension, by E. T. Demars, University of Utah; and a discussion of spelling problems in the junior high school by Anne D. Malatesta.

IN MAY

## PROBLEMS IN THE TEACHING OF THE FINE ARTS

CALIFORNIA SOCIETY OF SECONDARY EDUCATION

ROOMS 9-10, HAVILAND HALL, BERKELEY, CALIFORNIA

# CALIFORNIA JOURNAL
## OF SECONDARY EDUCATION


◀ May Journal ▶

▲

**CURRICULUM PROBLEMS IN FINE ARTS**

▲

## CONTENTS for APRIL


EDITORIAL COMMENTS . . . . . 198

EDITORIAL . . . . . 199

CURRICULUM PROBLEMS IN SCIENCE EDUCATION—A Symposium

The Teaching of Science in General Education . . . Cornelius H. Siemens 201

Natural Resource-Use in Science Teaching . . . . . Leo F. Hadsall 204

Improving the Training of Biology Teachers . . . . . Adrian Gentry 208

The Teaching of High-School Physiology . . . . . Wayne A. Durston 212

Do High Schools Properly Train Future Scientists? . . . . . Willard Geer 215

Science-Education Through Solving Real Problems . . . . . Frank Gillette 218

Science and LIFE . . . . . Ruth E. Maguire 222

Forecasts for Science Teachers . . . . . 229

BOOK REVIEWS . . . . . 231

CALIFORNIA'S NEEDS IN HIGHER EDUCATION . . . . . George D. Strayer 236

UNIVERSITY ADMISSION THROUGH EXTENSION CLASSES . . . . . E. T. Demars 239

SPELLING—THE JUNIOR-HIGH-SCHOOL HANDICAP . . . . . Anne Malatesta 241

RESULTS OF COMIC-BOOK SURVEYS REPORTED . . . . . 244

SECONDARY SKETCHES . . . . Everett V. O'Rourke 245

SUMMER SESSIONS AT UNIVERSITIES IN CALIFORNIA . . 249



The California Journal of Secondary Education is published by the California Society of Secondary Education in eight numbers during the year and is issued in the calendar months of January, February, March, April, May, October, November, and December, from the office of publication at 170 South Van Ness Avenue, San Francisco, California. One dollar and fifty cents of each membership fee in the Society is for a year's subscription to the Journal. Subscription to nonmembers is $3.00 per year; single copies, 50 cents. Annual subscriptions in all countries in the International Postal Union, $3.25. Members and subscribers are requested to report at once any change of address, giving old as well as new address. Entered as second-class matter at the post office at San Francisco, California, under the Act of August 24, 1912.

# CALIFORNIA JOURNAL
## OF SECONDARY EDUCATION

* * *



### EDITORIAL BOARD

PHEBE WARD.....*Editor*

HENRY C. LINDGREN.....*Managing Editor*

FRANK B. LINDSAY.....*Managing Director and Consulting Editor*

*Editorial Office:* Rooms 9-10, Haviland Hall, Berkeley, California

### CONSULTANT EDITORS (Ex-officio Members)

A. JOHN BARTKY, Dean of the School of Education, Stanford University.

EDWARD H. REDFORD, President, California Society of Secondary Education; Coordinator of Adult Education, San Francisco Public Schools.

A. J. CLOUD, President, Western Association of Colleges and Secondary Schools; President, San Francisco Junior College, San Francisco.

FRANK N. FREEMAN, Dean of the School of Education, University of California, Berkeley.

ROBERT S. HICKS, President, Association of California Secondary School Administrators; District Superintendent, Union High School, El Monte.

OSMAN R. HULL, Dean of the School of Education, University of Southern California, Los Angeles.

EDWIN A. LEE, Dean of the School of Education, University of California at Los Angeles.

### ASSOCIATE EDITORS

MARGARET BENNETT, Director of Guidance, Pasadena City Schools.

R. W. BORST, English Department, Junior College, Fullerton.

MRS. ROLLIN BROWN, President, California Congress of Parents and Teachers, Inc., Los Angeles.

BERNICE BUDLONG, California Home Economics Association; Supervisor of Domestic Arts, San Jose.

MARGARET H. ERDT, Supervisor of Art Education, San Diego City Schools.

ROSCO CHANDLER INGALLS, Director, East Los Angeles Junior College.

DAVID F. JACKEY, California Industrial Education Association; Professor of Vocational Education, University of California, Los Angeles.

ELIZABETH MATSON, California Association for Health, Physical Education, and Recreation; Instructor, Physical Education, College of Pacific, Stockton.

BAYARD Q. MORGAN, Modern Language Association of Northern and Central California; Professor of Germanic Languages, Stanford University.

HOWARD H. PATTEE, California Association of Independent Secondary Schools, Claremont.

JOSEPHINE V. RAUSCH, Social Studies, George Washington Senior High School, San Francisco.

WILLIAM A. SMITH, Professor of Education (Secondary), University of California at Los Angeles.

MRS. RUTH G. SUMNER, Mathematical Association of America—Northern California Section; Mathematics Department, Oakland High School, Oakland.

HELEN L. WIRT, Head of English Department, Oakland High School, Oakland.

F. M. YOCKEY, Principal, Technical Adult Evening School, Oakland.

## New Books

PUBLICATIONS sent to the JOURNAL editorial office for review include the following books and pamphlets:

ATWOOD, WALLACE W., and PITT, RUTH E. *Our Economic World.* Boston 17: Ginn and Company, 1948. Pp. viii + 529.

BARBAREUX-PARRY, M. *Education from Within.* Boston 20: The Christopher Publishing House, 1948. Pp. 82.

BARROWS, HARLAN H.; PARKER, EDITH P.; and SORENSEN, CLARENCE W. *Old World Lands.* New York 3: Silver Burdett Company, 1947. Pp. vi + 346. $2.88.

BROADY, KNUTE O.; BROADY, LOIS P.; and WESTOVER, ADA S. *Orientation and Guidance for High School Pupils.* Lincoln 8, Nebraska: University of Nebraska, 1947. Pp. viii + 320. Cost per set: $3.50 each for four or less, $2.80 each for five or more. (Each set includes pupil's textbook, test booklet with keys, personal-record leaflet, and teacher's manual.)

CHRIST, HENRY I. *Winning Words.* Boston 16: D. C. Heath and Company, 1948. Pp. xxii + 348. $2.00.

CLARK, FRED G., and RIMANOCZY, RICHARD S. *Money.* New York 3: D. Van Nostrand Company, Inc., 1947. Pp. 37.

DOLCH, EDWARD WILLIAM. *Problems in Reading.* Champaign, Illinois: The Garrard Press, 1948. Pp. 373. $3.00.

EDMAN. MARION, and COLLINS, LAURENTINE B. *Promising Practices in Intergroup Education.* Prepared for Administrative Committee on Intercultural Education, Detroit Public Schools. New York 19: Bureau for Intercultural Education (1697 Broadway), Dept. CS, 1947. Pp. 32. $0.20.

EDMONSON, J. B.; ROEMER, JOSEPH; and BACON, FRANCIS L. *The Administration of the Modern Secondary School,* Third Edition. New York, 11: The Macmillan Company, 1948. Pp. xl + 690. $4.00.

FOX, T. R. *The Struggle for Atomic Control.* Public Affairs Pamphlet No. 129. New York 16: Public Affairs Committee, Inc., 1947. Pp. 32. $0.20.

GROUSE, WILLIAM H. *Home Guide to Repair, Upkeep, and Remodeling.* New York 18: McGraw-Hill Book Co., Inc., 1947. Pp. x + 358. $3.00.

GUSTAFSON, A. F. *Using and Managing Soils.* New York 18: McGraw-Hill Book Co., Inc., 1948. Pp. xii + 420. $2.80.


# LEADING *the* FIELD

Three Outstanding
HIGH SCHOOL SOCIAL STUDIES BOOKS

OUR CHANGING SOCIAL ORDER, Third Edition

*By* GAVIAN, GRAY *and* GROVES

**A delightful new edition of the popular textbook for contemporary problems with sociological emphasis.**

FROM COLONY TO WORLD POWER, A History of the United States

*By* WILLIAM A. HAMM

**Interesting high school history for average and above average students—fair, impartial, and objective.**

THE AMERICAN STORY

*By* RUTH WOOD GAVIAN *and* WILLIAM A. HAMM

**Extremely readable high school history of the United States. Easily adapted to students of varying ability and interests.**

D. C. HEATH AND COMPANY

182 Second Street San Francisco 5

HOGG, JOHN C.; ALLEY, OTIS E.; and BICKEL, CHARLES L. *Chemistry, A Course for High Schools,* Second Edition. New York 3: D. Van Nostrand Company, Inc., 1948. Pp. x + 555. $2.88.

JOHNSON, DALLAS. *Facing the Facts About Cancer.* Prepared for the National Cancer Institute and The American Cancer Society. Public Affairs Pamphlet No. 38 (Revised). New York 16: Public Affairs Committee, Inc., 1947. Pp. 32. $0.20.

KARELSEN, JR., FRANK E. (Ed.) *Human Relations—A Challenge to Our Public Schools.* New York: The International Press, 1947. Pp. 74.

RAWLINS, GEORGE M., and STRUBLE, ALDEN H. *Chemistry in Action.* Boston 16: D. C. Heath and Company, 1948. Pp. viii + 568. $3.00.

STEINBERG, SAMUEL, and KNOWLTON, DANIEL C. *The American Way in Community Life.* Boston 16: D. C. Heath and Company, 1948. Pp. viii + 408. $1.92.

*Welcome to North High.* Phoenix, Arizona: North Phoenix High School, 1947. Pp. 44.

YAHRAES, HERBERT. *Make Your Town Safe!* Public Affairs Pamphlet No. 133. New York 16: Public Affairs Committee, Inc., 1947. Pp. 32. $0.20.


**Group-Guidance Textbooks For High-School Students**

By N. W. NEWSOM
HARL R. DOUGLASS, and
HARRY L. DOTSON

Book 3—Grade 9—
*Making a Choice*

Book 4—Grade 10—
*Living With Others*

Provide a progressive program of guidance for homerooms, guidance courses, and general-education programs. Written in the language of the student and in a personal way. Teachers without special training in guidance will find them very usable as student texts.

**MONARCH BOOK CO.**
GUNNISON, COLORADO

***Brilliantly lucid presentations***

***Concreteness attained by relating principles to detailed type studies***

***Skillful applications of biological ideas to human living***

**characterize the brand new 1948 edition of**

# BIOLOGY AND HUMAN AFFAIRS

**By John W. Ritchie**

Written by a distinguished writer and scientist who sees the beauty and the wisdom of the "life science" and makes it crystal clear to the student.

It is believed that in this New Edition, *Biology and Human Affairs* is the newest, most authentic, and most up-to-date treatment of biology now offered to the schools.

**World Book Company**

**121 Second Street**
**San Francisco 5**

**Represented by**
**Clyde S. and Don Jones**

## Next Month

THE appearance of a symposium on curriculum problems in the teaching of the fine arts in the May issue of the JOURNAL will bring to a close this year's series of curricula symposia. During the past few years, the JOURNAL has extended invitations to individual school systems to present groups of articles as parts of symposia. This practice has been followed in preparing the May symposium, which will include a series of articles by members of the San Francisco school system.

Keynoting this series will be an article on the philosophy of art education in secondary schools, by Dr. Edward Slockbower, Director of Art, San Francisco Public Schools. Mrs. Winona Tomanoczy, Art Instructor, Marina Junior High School, will contribute an article on the problems of art education in the junior high school. The fine-arts program for students enrolled in terminal curricula on the junior-college level will form the subject of a presentation by William J. Eckert, Head of the Graphic Arts Department, San Francisco City College. Fine arts in adult education will form the subject of discussion contributed by instructors in the Marina Adult School.

The editorial for next month will be the contribution of Margaret Erdt, Supervisor of Art, San Diego City Schools, who is an Associate Editor of the JOURNAL.

Other features of the symposium will be an article by Abe Milstein, Director of Music, Torrance City Schools, on the provision for expansion in a program of instruction in instrumental music; the presentation of the case for the teaching of photography in high school, by R. H. Behrens, who teaches at Garfield Junior High School in Berkeley; a discussion of the relationship between art and health, by John Gill of the Occupational Therapy Department, Weimar Sanatorium; and the description of an experimental program by Frances Nugent, Instructor in Art, Los Angeles County Museum of History, Science and Art, Exposition Park, Los Angeles. Several books on art education are also scheduled for review in this issue.

Articles of general interest to readers of the JOURNAL will include a description of education in Paraguay, by Ralph Choplin, U. S. Office of Education, Los Angeles, and a discussion of the necessity of taking stock of junior-college curricula, by Leland L. Medsker, the Dean of Wright Junior College, Chicago, who is President of the American Association of Junior Colleges.

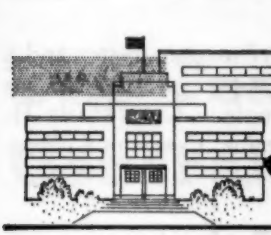
Another feature of the May issue will be the annual publication of the names of corporate and institutional members of the California Society of Secondary Education.

---

## New Officers and Trustees

THE following new officers of the California Society of Secondary Education were introduced at the March 23, 1948, meeting of the Board of Trustees: Dr. H. M. McPherson, Superintendent, Napa Union High School District, was elected First Vice-President, and Dr. William R. Odell, Superintendent of Schools, Oakland, was elected Second Vice-President. Miss Lillian M. Perry was re-elected as Secretary, and Dr. Edward H. Redford, Co-ordinator of Adult Education, San Francisco Public Schools, was re-elected President of the Society.

New members of the Executive Board are Dr. H. B. McDaniel, Associate Professor of Education and Psychology, Stanford University, and Dr. William R. Odell. Elected to the Board of Trustees were Dr. A. John Bartky, Dean of the School of Education, Stanford University, and Dr. Margaret Bennett, Director, Education for Women, Pasadena City Schools.



California Journal of Secondary Education

Vol. 23 APRIL, 1948 No. 4

## Science Teaching

Not all is well in the teaching of science in the secondary schools. Teaching methods have not kept pace with psychological findings; while science-curriculum development has made only small gains in the past two decades. A little reading and observation reveals the wide gap between recommendations of education leaders and practices in our secondary schools. It is important that educators understand why all is not well in science teaching.

The symposium of articles in this issue of the JOURNAL lists the chief difficulties to be overcome in order to have a better and a more complete program of science. The problems mentioned most often are:

1. Lack of teachers trained for effective, secondary-level science teaching.
2. Lack of a defined, state-wide program for science, especially in the high schools.
3. Failure to use effective content and methods to achieve the stated goals.
4. Failure to use immediate and real life problems in science teaching.
5. Insufficient preparation in mathematics given to college-bound students majoring in science and engineering.

The first article by Dr. C. H. Siemens, Director, Compton College, outlines the problems in attempting to give science instruction its rightful place in the general-education program of every student. Dr. Leo Hadsall of the Fresno State College science faculty outlines suggestions whereby regional natural resources can and should be used as teaching materials of the life sciences and points up shortcomings in various aspects of science teaching. Adrian Gentry of the Science Department in San Diego State College reports the results of a research study in which biology teachers tell their needs and deficiencies in the use of instructional aids. Wayne Durston relates his ten-year experience at Redondo High School in making physiology a functional course in the high school. The effectiveness of teaching college-preparatory mathematics, physics, and chemistry to future scientists is discussed by Dr. Willard Geer, University of Southern California professor and formerly a junior-college instructor. A dramatic description of how a biology class can "live with the scientific method" for a whole year is aptly told by B. Frank Gillette, Specialist in Science Education, Stanford University. The last article, contributed by the California State Department of Education presents with specific examples the values that lie in the use of current periodicals, films, and other sensory aids to learning.

The symposium will make worthwhile reading for administrators and science teachers alike. The statements and suggestions coming from authorities in the field should serve as a shot-in-the-arm for those looking for new

ideas. Many readers will find "aid and comfort" in the views and data presented. It is the hope of the authors that the article will stimulate thinking which will contribute to a better and a more balanced science program in the secondary schools.—Cornelius H. Siemens, *Director, Compton College.*

## Employment Outlook in the Scientific Professions

There is now a shortage of trained workers in leading scientific and technical professions. Research and development activity has expanded rapidly during and since the war. In addition, the great postwar increase in college enrollments, particularly in scientific fields, has created an increased need for scientists as teachers. At the same time, the supply of trained workers has been limited by the drafting of students into the Armed Forces during the war.

The shortages will be alleviated within several years, however. We are now training more young people in the colleges for the scientific professions than ever before. College enrollments, which reached 2,300,000 last fall, are more than 50 per cent higher than the prewar peak. The enrollment statistics for each major scientific field show that within the next few years a record number of trained people will be entering the professions. In 1947, the number of doctoral degrees conferred in all fields exceeded the prewar peak by 8 per cent; and the number of master's degrees was 33 per cent higher than the previous peak—pointing to a similar increase in the number of doctorates within the next few years.

While the need for workers in the scientific professions will continue to grow, it seems likely that the supply will catch up with the demand within several years. The warning signal has already been raised in engineering—largest scientific profession, employing one-third of a million people—by the Association for the Advancement of Engineering Education.

That there will be a plentiful supply of new graduates does not mean, of course, that there will not continue to be unsatisfied demands for *experienced* men in various specialties. Nor does it mean that there will not be continued need for the most capable and brilliant young people in all fields of science; there is never an oversupply of genius. It does not mean that competition for jobs for most new entrants will be keener, standards will be higher, and those with the best educational preparation will have the best chances of getting the jobs that they want.

What do these trends imply for the individual student interested in the sciences? This is the question as it is put to the Bureau's Occupational Outlook Service, which has the responsibility for analyzing occupational trends for use in vocational guidance.

1. The competition will be keen in all scientific fields; moreover, the situation is subject to rapid change as science opens new fields, as industrial use of research advances, or as the international situation changes. Therefore, young people who want careers in science would be well advised to choose their fields primarily on the basis of their interests and abilities, rather than upon considerations of economic outlook.

2. Each young person planning to go into the sciences must prepare to undertake a rigorous and thorough course of training and preferably to complete graduate study. The long-term trend toward requiring more advanced education for scientific professions, as well as the competition foreseen in the next few years, recommends this.

3. At the same time, it will be desirable for each student to maintain the maximum degree of occupational flexibility, so that he can adapt to changing circumstances. This requirement means getting the broadest basic scientific education, as well as specializing in a particular field. It means also being prepared to make adjustments and keeping an open mind on the subject of one's occupational specialization.—Summary of address by Ewan Clague, *Commissioner of Labor Statistics,* before the Educational Conference of the Seventh Annual Science-Talent Search, Washington, D. C., March 2, 1948.

# The Teaching of Science in General Education

By CORNELIUS H. SIEMENS

**The status and role of science in general education is theme of this presentation by Dr. Siemens, Director of Compton College. Dr. Siemens' contribution is particularly pertinent, not only because of his years of experience as a science teacher, science supervisor, and science teacher trainer, but also because of his concern with general education. (He is Chairman of the General Education Committee of the Junior College Association.)**

**Prior to his assuming his present post, Dr. Siemens was a professor on the staff of University of California School of Education, Berkeley campus. He is a member of the Board of Trustees, California Society of Secondary Education.**

IT doesn't take a Philadelphia lawyer to argue the case for the affirmative of the question: "Shall Science Be a Part of the General-Education Program in the Secondary Schools?" In this age of science, technological inventions have changed or affected almost every mode of man's living—particularly and spectacularly the techniques by which man destroys his brother. For the uninitiated or those less interested in science education, let us look briefly at the record of recent recommendations concerning the place of science in the required program of every student.

The ten "Imperative Needs of Youth" developed by the National Association of Secondary-School Principals includes the following forceful statement:

"*Imperative Need Number 6: All* youth need to understand the methods of science, the influence of science on human life, and the main scientific facts concerning the nature of the world and man."[1]

The Harvard Committee's Report, *General Education in a Free Society,* concludes that the abilities to be developed in every student are: "to think effectively, to communicate thought, to make relevant judgments, to discriminate among values."[2] It isn't difficult to see the implications for science teaching in at least two of the four abilities listed above. Furthermore, the Harvard Report recommends that general education be the aim of science teaching, "not the development of the skills and technical knowledge of the potential physicist and chemist." Specifically, the Harvard Committee recommends two years of introductory science and biology for all high-school students by the tenth grade.

The American Council on Education in its *A Design for General Education* calls for two one-year courses in science for all secondary students—one in biology and one in physical science. The Council recommends that the content be carefully selected and curtailed "in order to provide time for analysis and interpretation." It illustrates how this organization can be accomplished by outlining both courses,[3] giving the purposes and content. Whereas the course

[1] *Planning for American Youth.* Washington, D. C.: National Association of Secondary-School Principals. 1944, p. 43.

[2] *General Education in a Free Society.* Report of the Harvard Committee. Cambridge, Massachusetts. Harvard Press, 1945, p. 65.

[3] *A Design for General Education.* Washington, D. C.: American Council on Education, 1944, pp. 108-129.

in biology follows established patterns, the physical-science course selects thirteen large units of content to carry out the stated objectives. The units include: bodies in motion, work and energy, heat and temperature, connection between heat and energy, liquids and gases, kinetic molecular theory of matter, chemical change, the atom (chemical unit), electricity and magnetism, the electron theory, light, theories of light, and mathematics (its uses as a tool and language). Many social implications and life applications are woven into the course—at the expense of more content.

The three aforementioned recommendations for the inclusion of science in the general-education program should be sufficient to convince any administrator that his school is not fulfilling its obligation when it permits students to graduate without a required program of science education. And yet, as we look into our California state schedule for high-school graduation requirements, we find no mention of even one course in science! The State university does require a one-year course in a laboratory science, which is usually reserved for a very few students and then taught with the idea of developing the future scientist. But the individual school district determines its own local requirements in science. In most high schools, a one-year course in biology or physical science is required for graduation. We must conclude then that California does not have a high-school program in science that is required of all students, or even available to all students as elective subjects. Furthermore, it will take more than magazine articles or justifiable arguments to achieve for science its rightful place in the secondary-school program.

THERE are at least three reasons explaining the lack of science in the general-education program in the secondary schools of California. As in mathematics, the science program in most high schools is organized to offer the courses required for entrance in the State university — namely, laboratory courses in physics, chemistry, and biology. Enrollment in these laboratory-science courses is usually reserved (administratively or by student resistance) for the 20 per cent (or less) of the students preparing to go to college. As a result, fewer than 10 per cent of the high-school students take a course in physics, and fewer than 10 per cent take a course in chemistry. If any teacher-time or funds remain, additional courses for the non-college-going student may be offered. The California law requiring high schools to maintain courses to prepare prospective students for the State university, forces the small schools into a cart-before-the-horse science program described above. If it could be recognized (as it can be proved) that a good, two-year general-science program is as good preparation for college as one specialized course, more high schools would be able to set up and maintain a science program appropriate for *all* students.

A SECOND fundamental reason which makes it difficult to develop a general-education emphasis in science stems from the fact that science teachers have specialized in the teaching of one field of science—and at the most, two. They are eager to develop special courses; they shy away from the generalized or survey courses. Before a good program for all students can be developed, we must have teachers trained in the general-education values of science. We must have teachers who have a broad background in the various sciences. They must be able to synthesize and interrelate the methods and the imported ideas of all science fields for the adolescent and maturing mind.

Teachers must know how to help *every* student understand and appreciate the nature of the world and man, as viewed and measured by science. In short, the teacher must be equipped with a broad liberal-arts training and an up-to-date psychological "know-how" for teaching science to the masses.

A third, and even more fundamental reason, is the fact that we have as yet failed to define comprehensively what the secondary schools should offer and require as a general-education program for all students. Our state school code requires an incomplete mixture, including instruction in United States Constitution, American history, physical education, public safety and accident prevention, manners and morals, and "upon the nature of alcohol and narcotics and their effects upon the human system as determined by science." Obviously, the present state prescription cannot serve as a general-education blueprint. It is hoped that the plan for "Basic Education," now being formulated by the Committee to Develop a Framework for Public Education (State Department) will meet this all-important need of a science program in the secondary schools.

REALIZING that it is administratively impossible to substitute in a short time a complete general-education program in science for what we now have, we must turn our attention to what can be done now under existing conditions. The following list of suggestions is offered for improving our present science program, to the end that more students will obtain a broadened, more realistic, meaningful background of science education for modern living.

1. Broaden the scope of every science course to include content from related sciences and pertinent materials from other fields, especially the social sciences, psychology, and home economics.

2. Include aspects or complete units of science in many other courses throughout the curriculum, particularly in the required courses. Biographies of scientists could be included in English, physiology units in physical education, and home-chemistry units in foods classes.

3. Encourages science teachers to devote some of their professional upgrading to a study of other science fields and social sciences. Work in industry and in departments of health and sanitation also serves as excellent general-education background.

4. Provide for the development of source materials by competent "generalists" for the use of teachers. Teachers need a ready source of up-to-date facts, ideas, and developments in the field of science and their implications for classroom teaching. Such teaching aids should emanate from the State Department of Education or from a state science teachers' association.

5. Define the place and function of science in the required general-education program of secondary schools in specific terms, implemented by the State Department of Education.

6. Develop programs in teacher-training institutions that are aimed at producing the teacher who is prepared to guide the learning experiences of *all* students in the basic areas comprising the required general-education program. In the secondary school, we are long on "specialists" and very short on "generalists."

7. Spend less emphasis in science teaching upon factual content and more time and activities on the relationships and influence of technology upon man and his world, as required by general-education objectives.

IN conclusion, recent world events are demanding that science take on a conscience. Science teaching must give up its position as an isolationist in the curriculum. Through learning scientific facts, ideas, methods, and relationships, every student should be able to know and understand more fully both himself and his world-wide environment. For few, science will lead to professional and technological life-work; for the millions, science must help each person adjust to the changing world around him.

# Natural Resource-Use in Science Teaching

By LEO F. HADSALL

EDUCATION is fully as much a process of exploring, interpreting, and understanding the environment as it is a matter of acquiring those skills which are essential to proper adjustment to modern society and to earning a livelihood.

Science may be regarded properly as a significant body of knowledge, obtained through sense perception, organized in terms of significant meanings, set up as functional concepts and principles, and subjected to rigid test. Science may be regarded also as a significant method of learning about the environment and solving the problems associated with it.

It is well, then, to consider the role that science can play in the exploration of the immediate environment; in helping students to interpret pertinent aspects; in developing significant understandings; and in establishing functional attitudes—ways of living.

All too frequently, social-science instruction has failed to find the underlying reasons for social changes. The efforts of social science instructors and students have been limited frequently to a log of events or, at best, a superficial evaluation of movements—rather than a careful search for causal factors and a critical analysis of their effects.

The behavior of an organism in a specific environment is influenced by many factors. Among these are the inherent character of the organism, the conditioning it has undergone, and the factors comprising the environment. In analyzing science teaching and science teachers, it is wise to keep these factors in mind.

**Dr. Hadsall speaks in this article from his twenty-seven years of experience as a science teacher in rural schools, in an urban junior high school, and in college. During the sixteen years he has been at Fresno State College, where he is professor of biology, Dr. Hadsall has found time to write for and take an active part in the Planning Committee for California Science Guides for Elementary Science. He is also a member of the Committee on Conservation Education, a subcommittee of the California Committee for the Study of Education.**

Science instruction may provide information which will help the individual to act more wisely. It may also aid in acquiring further needed information and assist him in thinking more critically.

Today, I observed three kites hanging from a high power line. They were probably flown by elementary-school children, but older brothers and sisters or parents should have been adequately informed to discourage such practices. General science or physics should normally provide such vital information.

Last semester, I was on a field trip with my college class in natural history of vertebrates—a class which included young men and women who will become doctors, physical-education teachers, biologists, high-school science teachers, housewives, and citizens. As we drove along a rural road, we observed a sparrow hawk on the road which was picking at the remains of a freshly-killed animal. We stopped. The sparrow hawk

was loath to leave its food, but shortly flew to the top of a nearby telephone pole. The remains on which it had been feeding was that of a house cat that had been killed by a passing car.

We left the remains on the road and drove through the Sierra foothills, stopping to remove the bodies of red-tailed hawks and a prairie falcon from fences, where they had been hung by successful, but poorly-informed hunters. These species are protected by state law. We may scarcely call such hunters sportsmen. We noted each species, considered their relative value, why they had been killed, and why they had been hung in a conspicuous place.

RETURNING at dusk along the road where we had observed the sparrow hawk feeding earlier in the day, we noted that during our absence the sparrow hawk had been killed. Absorbed in feeding, it had been crushed by a passing car whose driver evinced little regard for wildlife on the highway. We stopped to note the incident more carefully, and while I was engaged in measuring the distances between the bodies, and from the sides of the highway, I heard one student comment to his fellows, "This is partly our fault."

This comment from a student without special interest in science seemed important to me as evidence of the development of critical thinking. It was more significant than if he had presented me with a list of all the protected species in the area. If I had demonstrated equally critical thinking earlier in the day, we would have removed the remains of the cat from the highway and saved a beneficial sparrow hawk from destruction.

Large classes, problems of transportation involving safety, have restricted the activities of high-school science instructors. Too frequently, such instruction becomes formalized, bookish. Visual aids have been developed with the result that a visual image has been substituted for the thing itself. There is no better form of visual education than the natural object in its natural environment.

IF science is to be taught adequately in secondary schools, time must be provided for first-hand experiences with real things in their natural environment. In biology, this may be with plants and animals, native and introduced, domestic and wild, economic as well as those of general interest. In physics, it may involve the study of irrigation, construction of dams, farm mechanics, other local engineering enterprises. In chemistry, it may involve the study of water purification, local health problems, the chemicals used to control insect pests and plant diseases, the preservation of foods. The consideration of the problems of sewage disposal may some day provide more intelligent voting on local public projects.

I have noted that secondary-school science instruction may become too bookish. The high-school biology laboratory should be neither an animal morgue nor a herbarium, but a vivarium. Workbooks and texts should be regarded properly as tools, not followed without flexibility. During my service in California, I have been disappointed to learn of programs so inflexible that workbooks prepared by easterners for eastern conditions are followed precisely. It is this type of teacher who gathers the notebooks after each class, has them corrected during class, and burns them at the close of the school year. Collections made by students in such classes are relegated to the furnace or added to the school collection, supposedly "to honor the student" but usually without benefit of permission from the collector. Thus, the practice of notebook copying and trans-

ferring of collections is avoided. Such teachers become so restricted in their programs that they cannot use spadefoot toad tadpoles which a student brings to class because they have already finished amphibia and are now engaged in the study of birds.

THE rural schools of California are gloriously provided with outdoor laboratories. The larger cities have splendid museums and parks. These should be regularly utilized by science classes. In rural areas, investigations may be conducted of local natural resources. Individual studies of local species will provide clearer understandings of the environment. At present, the residents of the great central valley are confronted with a water shortage that threatens to impair the agricultural industry. Alert science teachers will be quick to recognize learning possibilities in this situation. The problems of water table, irrigation, and snow pack are intricately tied up with the existence of local fauna and flora, as well as with our agricultural crops. Investigations of these interrelations and the means by which plants and animals attempt to meet adverse conditions provide lively problems for investigation.

I fear that high-school science, like college science, has tended to become too formalized. Large bodies of subject matter have been developed. Students are expected to consume, digest, and assimilate these. Unfortunately, teachers frequently expect them only to regurgitate it—a process in which many indulge, but in poorly-digested form. Such bodies of content are often mere adulterations of more advanced studies—college courses. Woe to the high-school science teacher, especially to his students, who attempts to duplicate his college course. College curricula have long been in need of sharp revisions.

If a significant function of high-school science teaching is to assist students to meet their daily problems with understanding appreciation of their environment, it will be necessary to encourage resource-use studies in the immediate areas. These studies furnish ideal situations for the practice of the scientific method.

I heard a professor of science education in a leading American university state only recently that we had utterly failed in trying to teach the scientific method. What this gentleman failed to note was that for years his students had attempted to teach the scientific method by having their students memorize the steps in the method. They spent the rest of their time in setting up principles and generalizations to which they gave lip-service. Every science teacher and administrator should realize that there is no short cut to developing the scientific habit—in learning to practice the scientific method. Students must be taught to recognize problems. Under the guidance of capable teachers, they may proceed to gather evidence, making adequate provision for sensory, experiences; formulate hypotheses; arrive at tentative conclusions, which they should then subject to severe testing. The problems of science cannot be solved properly by a show of hands.

ELEMENTARY-SCHOOL people are already grasping the significance of science concepts in establishing social attitudes pertaining to health, safety, humaneness, and conservation. They have learned that an adequate understanding of the environment involves some understanding of the elements which comprise it and their interrelations.

Students of recreation throughout California will do well to consider introduced plants and animals, as well as those native species now abundant, those exterminated, and those

threatened with extinction. The study of plant life in a California park may well provide a good introduction to social science, as well as natural science. What Australian species are present here? How do they respond to environmental conditions so different from those in their native habitat?

There are those who will be quick to object to proposals such as I have included here. Even those inclined to agree will quickly point out that secondary-school teachers are very busy people. They have large numbers of students under their direction. They frequently teach several subjects. There is little provision or encouragement for sensory, first-hand experiences with real things, particularly in the natural environment. Some high-school science instructors are not adequately trained to do the type of teaching which I have proposed.

SCIENCE teachers are often loaded too heavily. Administrators must realize that proper laboratory and field study is time-consuming. So is athletics. And I am ready to defend that field also. However, there is fully as much reason to provide adequate facilities for field experiences in science—in resource-use—as there is for athletic contests.

I have just been preparing a summary of subject combinations taught by science teachers in the secondary schools of California. Administrators should take stock. It is doubtful whether any individual could handle adequately some of the combinations that are assigned.

Teacher-training institutions should re-evaluate their teacher-training programs. State colleges in California were recently accredited for training teachers in the secondary field and had an opportunity to set a new pattern. In at least one institution, department rivalries—combined with the lack of vision of professional educators—was partly responsible for this institution's copying the university pattern. In the area served by this institution, where 80 per cent of the graduates enter positions in which they must teach combinations of biological science and physical science, this college insists on specialization either in biology or in physical science. But specialization does not lend itself well to training for resource-use instruction.

IT has long been noted that teachers teach what they know and as they have been taught. Let those in teacher-training institutions search out and remove the mycelia from their courses. They, too, must demonstrate their capacity for releasing themselves from the shackles of the text. With enthusiasm, they must turn their attention to the problems in their immediate environs.

**Publication of Save-the-Redwoods League**

The series of educational publications issued by the Save-the-Redwoods League includes "Trees, Shrubs and Flowers of the Redwood Region" by Willis L. Jepson; "The Story Told by a Fallen Redwood" by Emanuel Fritz; "A Living Link in History" by John C. Merriam; and "Redwoods of the Past" by Ralph W. Chaney. These pamphlets may be secured from the League at ten cents each.

The League was organized as a non-profit corporation to rescue from destruction representative areas of our primeval forests. Information about membership in the League may be secured from Dr. Robert G. Sproul, Treasurer, 250 Administration Building, University of California, Berkeley 4, California.

# Improving the Training of Biology Teachers

By ADRIAN GENTRY

**One characteristic of educators is their constant striving to develop and improve their professional techniques. The JOURNAL presents the first step in the development of a new technique by publishing this research paper by Mr. Adrian Gentry, instructor in biology and science education at San Diego State College.**

**Mr. Gentry has done graduate work in zoology at the University of Kansas and in education at the University of California at Berkeley. He has taught in high schools in Alaska, Kansas, and Washington.**

IN an effort to vitalize biology courses in the secondary schools, leaders in educational thought and practice have sought to make teachers increasingly aware of the value of instructional aids. Teachers of biology have been urged to make the community their laboratory, to use living things instead of textbooks to study life, to encourage science hobbies, to make biology function as an integral part of the students' behavior. Above all, they have been told that they must do more than give lip-service to the scientific method. As one educator has phrased it, students must become so familiar with the scientific method that it becomes a way of life.

If teachers are to carry these techniques into their classrooms, they must have more training in the skills and the knowledges necessary for the proper utilization of many types of instructional aids. Richardson,[1] in discussing the need for such training, points out that provisions for training in a wide variety of laboratory and demonstration techniques should be included in teacher-education curricula. He believes that, otherwise, prospective teachers will have a very inadequate concept of the functions of the laboratory in the learning situation because they have been conditioned by a long experience of laboratory work in which they have followed, line by line, the directions of the manual. The recent comprehensive report of the National Committee on Science Teaching[2] states that even when subject-matter courses are better adapted to the needs of teachers than at present, the instructor in science education will still find that prospective teachers require guidance in using many of the basic skills necessary to present demonstrations and conduct laboratory work. The report also stresses the importance of training in the selection and the use of projection aids and free materials.

Many teachers of biology agree with the writers mentioned above that there is a need for more training of this nature. In a survey sponsored by the Committee on the Teaching of Biology,[3] teachers' suggestions regarding training courses were invited. The criticism

1 J. S. Richardson, "Problems in the Education of Science Teachers," Science Education, XXIX (December, 1945), p. 251.

2 National Education Association of the United States, *The Education of the Science Teacher*, Report of the National Committee on Science Teaching. Washington, D. C.: American Council of Science Teachers of N. E. A., pp. 61-62.

3 Oscar Riddle, ed., *The Teaching of Biology in Secondary Schools of the United States*. The Committee on the Teaching of Biology of the Union of American Biological Societies, 1942, p. 33.

most often made by these teachers was that there should be more special methods of a practical nature. Second on the list was a plea for better training in laboratory and demonstration techniques.

THIS discussion emphasizes the fact that teachers of biology should have more experiences involving the choice and wise use of a variety of instructional aids. In order that those charged with the training of teachers and prospective teachers may assist in the solution of these problems and related ones, the following important questions need to be answered: (1) Which of the many available aids are considered by experts in the field to be most valuable? (2) Which of the recommended aids are being used by a majority of teachers of biology in secondary schools? and (3) Where did the teachers acquire the skills and knowledges necessary to use these aids? A recent investigation which attempted to throw some light on these questions as they affect teachers of biology and teacher-training agencies in California is summarized in the following paragraphs.

In order to determine which skills and knowledges in the use of instructional aids are most important for teachers of biology in secondary schools, a check list was prepared and distributed to 110 highly-recommended teachers and supervisors of biology in a variety of sizes and types of secondary schools scattered throughout the western half of the United States. Activities included in the list were obtained from high-school texts, workbooks, and courses of study; methods texts; professional magazines; and from the suggestions of a number of expert teachers and specialists in science education.

The final draft of this list, referred to in the study as Check List A, contained 372 activities involving the use of instructional aids which might be used by teachers of biology in secondary schools. Eighty-two usable returns were received. A simple weighing scale was used to rank the items on the check list with respect to their importance as judged by this jury of experts. Two points were given each time an item was marked essential; one point, each time an item was marked desirable; and a minus point, each time an item was marked unnecessary. Finally, the items were ranked in deciles according to the total scores they received.

THERE was considerable agreement on the importance of some of the activities. For example, "Use and care of microscopes" and "Recognize common plants and animals in the field" each received a total score of 161 out of a possible 164. Other skills which were ranked in the tenth decile as to importance included those involved in preparing temporary microscopic slides; setting up and maintaining aquaria; testing for various foods; demonstrating osmosis, the connection of sunlight with photosyntheses, and the structure of plants; knowing sources of laboratory equipment and materials; knowing how to make use of community resources; dissecting plants and animals; using classification keys; operating projection equipment; developing resource and teaching units; directing field trips; making killing bottles for insects; preparing bacteria cultures; making quick, clear blackboard sketches; and reading and interpreting graphs and tables.

Further evidence of the jury agreement is indicated by an analysis of rating-scale data from the entire check list. Eighteen (5.5 per cent of the 372 items) were judged to be essential or desirable by all of the respondents checking them, and 161 (43.3 per cent)

were so rated by 90 per cent or more of those checking them.

Although there was less agreement as to which items were unnecessary, some activities, such as those which dealt with the use and care of power tools and the making of ground-glass slides, received enough checks of "Unnecessary" to give them a score of less than zero.

Thus, it is possible to select a number of skills involving the use of instructional aids in which teachers of biology in secondary schools should be proficient, according to the opinions of a group of experts. It is also possible to pick out activities which most of the jury think are unnecessary for these teachers. An analysis of the bulk of items in the middle deciles, however, reveals considerable disagreement among the respondents as to the importance of these items. Factors causing this difference of opinion included the training and interest of the teachers, the location of the schools, the number and sequence of science courses in each school, the desires of community pressure groups, the amount of funds available for materials and equipment, the textbook and course of study used, and the services rendered by other departments in the school—i.e. audio-visual department.

WHAT about teachers of biology in the secondary schools of California? Are they proficient in the use of aids which the experts rate as essential or desirable? Where did California teachers acquire the skills necessary to perform these worth-while activities? Data bearing upon these questions were obtained from a second check list (Check List B) which included, for the most part, activities ranked by the jury in the upper seven deciles as to importance. Check List "B" was distributed to the 500 teachers of biology listed in the *California School Directory* for 1945. These teachers were asked to check each activity which they had performed and in which they were reasonably proficient and also each activity which they *thought* they knew how to perform. They were further asked to check whether they learned to perform each activity while in school, while teaching, or elsewhere. Two hundred and twenty-one usable returns were received.

DATA from this check list reveal that 70 per cent or more of the California teachers responding were proficient in the use of all of the activities ranked in the tenth decile as to importance by the experts. A further analysis shows, however, that only 44.6 per cent of the 260 activities have been performed by 70 per cent or more of these teachers. Failure to use more of the important activities was due to several factors. Inexperienced teachers and those who did not have biology majors lowered the percentage somewhat. However, 90 per cent of the respondents had taught biology more than two years, and 72 per cent had college majors in biology.

The possibility that this failure was due in part to a lack of knowledge on the part of the teachers is indicated by the data which show that 70 per cent of the California teachers do not know how to perform 19.2 per cent of the recommended activities. Half of these teachers think they know how to perform nearly all of the activities listed. What of the other half? Why don't they have the necessary skills and knowledges to use a larger percentage of the aids? A lack of adequate training seems to offer one answer.

Typical comments by the respondents included: "What I needed most was not the names of bones in the crocodile's skull or the development of the inferior vena cava, but the names of common

plants and animals"; "How about putting a little more Life in our life-science classes and a little less formaldehyde?"

TO obtain more specific information concerning the adequacy of college training in this respect, it is necessary to summarize the "Where Learned" data from Check List B. These data show that only 5.4 per cent of the recommended activities were learned in high school or college by more than 70 per cent of those responding and that the average teacher of biology learned to perform only one-third of the 260 activities while in school. The survey indicates that, in general, colleges give adequate training in activities dealing with the chemical applications to biology, plant and animal structure, microtechnique, and bacteriology. There is a definite lack of sufficient training in such areas as nature study in the field, conservation, horticulture, science clubs, first aid and hygiene, the use of projection aids, and the use of community resources.

Probably the most valuable contribution of this study is a check list of 372 skills and knowledges involving the use of instructional aids ranked as to importance by a select group of teachers and supervisors of biology. This list should be useful to college teachers of methods in biological science. Students in such a course at San Diego State College are asked to check the activities which they can perform with a reasonable degree of proficiency. If a student is lacking in some of the important skills, he is given an opportunity to acquire them as a part of the methods course or is advised to take additional courses which will fill in the major gaps in his training. It has been found impossible, however, to allow sufficient time for activities of this sort in the traditional two-unit methods course. There is a need for increasing the number of units allowed for this course or to develop a new course in laboratory and demonstration techniques applicable to biology as taught in the secondary schools.

MANY teachers have expressed a desire for a handbook which would include detailed directions for performing demonstrations and experiments not requiring detailed college training and information concerning sources and uses for other types of aids. The activities on the check list considered most important, might form the basis for such a handbook. The check list might also serve as a guide for in-service training agencies in setting up workshops for inexperienced teachers in their schools.

While extension of special methods and audio-visual courses may assist prospective teachers of biology in obtaining some of these necessary skills and knowledges, they can offer at best only a partial solution to the problem. In the long run, the responsibility for improvement of training programs in this regard lies with the life-science departments of the colleges and universities. Subject-matter courses need to be set up which are more adapted to the needs of prospective secondary-school teachers. These new courses should be organized around such functional areas as the maintenance of personal and public health, the human life span, conservation and wise use of natural resources, and the social implications of biological science. Instruction methods used in these functional courses should be in line with the best educational procedures.

Finally, certification requirements need to be revised so that only those teachers who have had at least a minimum amount of training in life sciences will be expected to shoulder the responsibility of guiding our young people in this important aspect of their secondary-school education.

# The Teaching of High-School Physiology

By WAYNE A. DURSTON

**Mr. Durston instructs in botany and chemistry at one of California's newer junior colleges — El Camino Junior College at Alondra Park. His record of twenty-two years of science teaching at Redondo High School, including eight years as Chairman of the Science Department, lends particular authority to his presentation. Mr. Durston holds his degrees from Stanford University.**

DURING the past ten years, the writer has had an opportunity to organize and direct a course in high-school physiology in which an attempt was made to overcome some of the gremlins that beset this subject more than other science courses.

In reorganizing, the first step was to re-examine the aims and the objectives of the course. The objectives were stated as mainly nonvocational, though all pre-nursing students were counseled to include physiology in their course of study. Also, the objectives of the course were planned in terms of students. Every effort was made to prevent their degeneration into a series of statements gathered from somewhere in the stratosphere of pedagogical thinking, printed on the front page of the course outline, and then forgotten. They were to be something within reach, something that would be functional in our situation and would justify the existence of the course. Also, the formation of proper and scientific attitudes was felt to be more important than the acquisition of facts or development of skills, important though the latter might be.

The following list of aims and their explanations is not complete. It is meant to reveal the underlying philosophy of the teacher who prepared them.

**Citizenship aims:**

Opportunity should be allowed each person to share in the everyday life of the class; be co-responsible for the care of equipment; and be required to work with others in the preparation of projects and reports.

**Health aims:**

The student should be encouraged to evaluate his health status and make a study of the factors contributing to his good or poor health.

**Vocational aims:**

The contribution of high-school physiology to the future work of the individual was nonexistent for most students. Prospective nurses and nurses' aides were expected to do experiments that would increase their skill in the use of the microscope with substage illumination, pipettes, thermometers, blood tubes, and other special equipment that they might encounter in their general training.

**"Scientific Method" aims:**

The belief held by many science teachers that most students can be taught in a few lessons to appreciate the scientific method, and even learn to apply it to their own problems, is not borne out in practice. Though we need to develop better techniques for testing our students' ability to think scientifically, every course should allow opportunity for those students who are able to approach their work with a scientific attitude. Activities experienced by the student should enable him to practice the scientific method.

**Objectives:**

The specific objectives of the course were listed in connection with each unit and are not repeated here—for purposes of brevity.

The course of study consisted of ten units. Each was allotted about the same length of time for completion, but time

consumed in actual practice was variable, depending upon the interests of the class. Each unit consisted of a unified set of activities; each planned to contribute to one or more of the unit objectives. The unit titles were:

1. The Tools and Methods of Physiology (Cells, Tissues, Heredity)
2. Locomotion—Skeleton and Muscles
3. Circulation, Endocrine System
4. Respiration and Excretion
5. Nutrition (Foods, Diet, Digestion)
6. Nervous System and Emotion
7. Sight and Hearing
8. Other Special Senses—Narcotics
9. Hygiene, Reproduction, Eugenics
10. Bacteria, Disease, Sanitation

Each unit was opened with a period of discussion, including an overview of the work of the unit, during which the teacher attempted to find out something about the previous experience of the students and to create an interest in the studies about to be undertaken. At this time, the student was introduced to a complete list of the activities that would be included in the work of the unit. This list was usually mimeographed, but occasionally it was written on the blackboard to be copied. At this time, those activities classified as required and those classified as optional were indicated.

THE activities employed in presenting the course material and carrying out the objectives were variable and numerous. The complete list of activities for each unit was far more than any one student could be expected to undertake. Certain activities were designated as minimum though the only work actually "required" was the performance of certain experiments. An able student was expected to carry through a variety of activities, including the ones designated as minimum and some of those designated as optional.

The textbooks used were those written with a "healthful living" point of view. Assignments in the text were made in connection with each unit. The reading ability of the pupils in the course varied greatly, and it was necessary to provide simpler reading materials for a certain percentage of students. This provision was accomplished through the use of elementary-school texts in physiology. Reading reports or the answers to questions were used to motivate the reading assignments and also served as a means of evaluation of the assignments covered.

The minimum knowledge, skills, habits, and attitudes needed to pass the course with the lowest mark consisted in performing a minimum number of experiments. Experiments were graded according to difficulty, and the more complicated ones were reserved for the more gifted students. However, if some slow-working student exhibited a special skill needed to carry through a particular experiment with success, he was not denied the opportunity to practice that skill because of otherwise mediocre work in other phases of the course activities.

Reports were required on the basis of experiments performed. These reports were prepared in the laboratory-classroom. They varied in type, depending upon the problem involved. At some time during the unit, the student was called upon to follow directions and make observations and record them in writing and illustrate them with suitable drawings.

MOST students can draw as well or better than they can write. Expressing ideas by properly-labelled drawings was used extensively in preparing the experiment reports where the student recorded his observations by making simple line drawings and in illustrating the anatomical phases of his reading reports. During the study of Unit VIII (Narcotics), the drawing ac-

tivity was emphasized and made use of in motivating the study of textbook illustrations and as a means of evaluating that study.

The activities in each unit included references to articles in current magazines. Students were encouraged to add to the card-file bibliography that was kept at the desk when they discovered pertinent articles. The magazines found most useful were "Reader's Digest," "Science Digest," "Health Magazine," and "Hygeia."

Each student was expected to read and report in writing upon four articles of his choice each semester. The subject of the report was required to be related to the unit being studied at the time the report was made. Reports that were regarded as especially well prepared and whose subject fitted well into the general class situation were given orally for the benefit of the entire class.

The group-discussion phase of the classwork was not regarded with antipathy, but it was asked for often by students. Discussion was planned at no set time nor necessarily on the same day in two classes. Whenever a problem arose or a difficulty presented itself, a small group conference was in order. If the problem was general, or the teacher felt that student-time might be saved later, the class was included in the discussion.

The oral presentation of the important material in each text assignment was made. The students kept notes, following a previously-prepared outline written on the blackboard.

The use of examinations for evaluation of students' progress was limited to one at the end of each unit. All work submitted by the student was point-scored and added to his cumulative record for that unit. A passing grade in the unit was allowed for any student earning one-half the possible number of points on required work. An A grade was allowed any student earning three-quarters the possible number of points on all work—required and optional.

## Impact of the War on Science

"The war rightfully brought an emphasis on science which it should continue to have in time of peace. Pure science has always had sufficient emphasis as a college preparatory subject, but the applications of physics, chemistry, and biology to problems of everyday living have been neglected. The general education of the student who is not going to college should include the applications of physical and biological science to the most important needs of modern life. Physical science courses for non-college preparatory students were spreading rapidly until they were temporarily displaced by the pre-induction courses during World War II, but it is reported that such courses are again increasing in number.

"The war has accelerated scientific developments which will be rapidly used in the production of goods affecting every phase of peacetime living: food, clothing, shelter, health, leisure, and transportation. Some of the new industrial products are: lightweight automobiles, light metals, plastics, synthetic rubber, sulfa drugs, penicillin, new fabrics, and prefabricated houses.

"The need of physics for armed combat has ceased to exist for the average youth, but he will have a great need for a better understanding of the hundreds of appliances which science and invention have added to man's comfort and convenience. The future will bring an even greater production of goods based on science. More than ever boys and girls will need to understand the applications of science to daily living."—Henry Harap, *Peabody College, Nashville Tennessee,* in The High School Journal, Vol. 31, No. 1 (January-February, 1947), pp. 9-10.

# Do High Schools Properly Train Future Scientists?

By WILLARD GEER

**In writing on the familiar subject—what the college expects of the high-school graduate—Dr. Geer cannot be accused of "ivory-tower" thinking, for he has taught science in high school and in junior college before his appointment to his present position at the University of Southern California. He has, therefore, more than the usual grasp of needs and motivations of high school students, as well as of the conditions under which they must learn. The breadth of Dr. Geer's interest in secondary education is indicated by his concern with teacher training in the field of science education and in the development of survey courses in physical science for students who are not majoring in science.**

IF I may be permitted to speak for the colleges and the universities, I believe that they would wish me to make one strong plea: that the future scientists who are now students in high school be not forgotten or neglected in the administrators' and teachers' current concern for the "average" student in the student body. Surely, it is not necessary to reiterate the importance to the nation of the future dentists, doctors, engineers, chemists, and physicists who are now preparing for their college science work. But it is important that the high-school courses of study be arranged so that these students can be properly accommodated.

In discussing this problem with college instructors, I find that they feel that leaders in secondary education have swung the emphasis of high-school work so far away from the early concept of preparation for college that the future Oppenheimers and Lawrences are marched through high school with a great deal of vocational and avocational sampling, but somewhat crippled or retarded as far as an essential background for college science work is concerned.

It is upon these questions: What constitutes a good high-school preparatory background for the future scientists? and are they well- or ill-prepared for their college work? that this article concerns itself. In an effort to make an objective study of the questions, a survey was conducted of the physics classes at the University of Southern California (these classes included the engineering physics classes and the pre-medical and pre-dental or general-college physics classes).

In a sampling which included about one-third of all students enrolled in elementary physics, it was found that only 43 per cent of the general-physics students and 64 per cent of the engineering-physics students took trigonometry in high school. This situation would seem to indicate a serious handicap when it is understood that trigonometry is a prerequisite to engineering physics and is so desirable that even though it is not required as a prerequisite, it is recommended for general physics. In the case of the engineering students, a deficiency in trigonometry simply means a delay of a semester or two in the completion of his entire college course until the lack can be remedied.

It was also found that 75 per cent of the general and 59 per cent of the engineering-physics students were not advised to take trigonometry by their high-school advisers. However, the advisers alone were not to blame, for 35 per cent of the students who did not take trigonometry reported that their high schools did not offer this course during a semester when they could take it. Of those who did not take trigonometry in high school, 32 per cent of the general-physics and 65 per cent of the engineering-physics students report that they have been delayed one or two semesters in their college work, indicating not only a serious personal loss in time, but a most serious economic loss in additional expense to complete a college career and a loss of six months to a year in earning capacity after graduation. These data seem to indicate a serious misplacement of emphasis or a lack of understanding of the importance of trigonometry by high-school administrators.

The 488 students included in this survey, however, do now realize the importance of this subject. When asked what they considered to be the ranking of certain high-school subjects in order of importance as preparation for their college physics courses, they placed trigonometry first. High-school physics and second-year algebra they ranked as close second and third place; while solid geometry and chemistry were a distant fourth and fifth in rank.

ALL of the above data would seem to us, in the university, to show needlessly poor preparation of these young scientists and the penalties which they have to pay for that poor preparation. Lack of advice concerning, or absence from the curriculum of, fundamental courses which are deemed important by the students themselves when they reach the university and by the university instructors would seem to be inexcusable.

As a remedy to this situation, we should like to suggest that high-school advisers make sure that all pre-science majors take seven or eight semesters of mathematics and emphasize that their foundation in mathematics is more important to them than any of their other preparatory courses. We would like the teachers of these courses to set up minimum standards and spend time upon them, rather than making an attempt to cover too many topics. More time should be spent in applying mathematics to real problems in the physical phenomena with which the students are in daily contact.

IN the matter of the high-school physics courses, the universities would prefer that the high-school teachers cover all divisions of physics, introducing concepts important in each field rather than the practice (at present much too common) or stagnating the course in a welter of problems in mechanics while slighting electricity and modern physics. Problem work should be left largely to the college physics courses or given to the advanced algebra and trigonometry classes as exercises in their fields. Problem work overused in high-school physics often kills the keen interest the embryo-scientist has in learning the physical principles behind radio television, radar, the automobile and airplane, fluorescent lights—yes, even nuclear power.

All of this makes it appropriate to remark that the advent of nuclear power has interested many young persons in becoming future physicists, but many more are needed. Within the next decade or two, the very existence of our nation may depend upon the excellence of our physicists. Forward-looking educators will have a responsibility in the proper fulfillment of that need.

It is not a divergence to call for a rethinking about our educational prepa-

ration of future scientists in the levels even below high school. Certain schools of thought have advocated the postponement of subjects until the average child could do the work involved with little or no trouble. The amount of knowledge and the training and the skills required of a scientist are now increasing at such rapid rates that it is necessary to consider the curriculum in a reversal of the postponement belief.

We, of the universities, should like to have many elementary concepts of mathematics and science introduced in their simpler forms in the junior high school and expanded during high-school training so that students coming into college physics classes would have years of familiarity with them rather than having to go through that long period of mental fog that so often comes at the beginning of the first-year college physics classes when the professor takes his class through the intricacies of a particular concept in the necessarily short time which can be allotted to it. To illustrate: the addition and subtraction of vectors can be taught to junior-high or even sixth-grade students; and the use of the cosine, sine, and tangent can also be started in these grades or lower.

EXPERIMENTAL evidence upon this subject can be introduced.[1] These important and basic concepts are very simple, but the teacher needs to see the simplicity. Unfortunately, very few junior-high-school teachers could now teach their students about vectors because most of them are blind to vector application. The problems raised by this newer concept of pre-science training might call for a re-education of the elementary- and secondary-school science teachers—at least in refresher courses in science and mathematics.

1 Article on "Madame Maria Montessori, First Progressive," *Time Magazine*, Vol. 50 (October 20, 1947), p. 56.

## Science, Technology, and the Secondary School

"We need today a secondary school that can capitalize on the work of the best elementary schools. We need a school where young people can really experiment continuously with things and with ideas; can experiment with group living, with personal and group planning; can experiment with projects involving their peers and their elders. We need a secondary school that through its program and its day-by-day living will insure maximum health for all its young people. We need a school that will create the conditions necessary to give young people first-hand experiences with a democratic society, a chance to study it and understand it from an historical as well as a contemporary standpoint. We need a school where young people can have adequate opportunities to get on with the job of preparing themselves for useful citizenship, able to participate in the work life, the economic and political life, the social life of their community, their nation, their world. We need a school that will make a study of change, a basic element in the program of the young people and of the professional staff. We need a secondary school that will utilize the most reliable findings from the new bio-psychology, the new sociology, the physical sciences as a basis for building its program. We need a secondary school which will constantly employ the best and most usable research methods and experimentation to find answers to its problems, to reconstruct its program, and its organization of learning experiences. Finally, we need a secondary school that knows how to work with its immediate community and with other schools and communities to gain these ends."—HUBERT M. EVANS, *Research Associate in The Horace Mann-Lincoln Institute of School Experimentation and Assistant Professor of Natural Sciences, Teachers College, Columbia University*, in THE BULLETIN OF THE NATIONAL ASSOCIATION OF SECONDARY-SCHOOL PRINCIPALS, Vol. 31, No. 149 (November, 1947), p. 97.

# Science-Education Through Solving Real Problems

By FRANK GILLETTE

**As a high-school teacher of science and as a high-school principal, Mr. Gillette became aware of the need for using school projects as a method of teaching science. This approach to education—through the solving of real problems—was valuable background for his experience in the Navy, where he served as an instructor in anti-submarine warfare. Mr. Gillette is now Director of Student Teaching, School of Education, Stanford University, where he is also consulting specialist in science education.**

IT is the first of September in Pleasant Valley, Midwest U. S. A., as Donald Jones surveys his private bailiwick, a room designed for high-school biology classes. It is in a new building, the pride and joy of six hundred pupils who will soon be enlivening the halls. The building has just been completed during the last few weeks; the smell of new paint and cement pervades the air.

Teacher Jones smiles warmly as he surveys the physical equipment in his combination lecture-laboratory room. Yes, the superintendent and the school board were generous and wise when they laid the plans for the new school plant. This building will be quite a relief after the old fire-trap where Jones has taught during the last several years. No improvised tables here, no ugly storage cupboards along the walls. The whole community should be proud of this monument to its enthusiasm for public education in Pleasant Valley.

But Jones is not content. He is an aggressive young man with the zeal to make teaching a really vital process. He believes that his biology classes should accomplish something useful, something concrete. While the pupils are learning the understandings and the skills considered so important for personal development, they should be attacking problems which are real to them. He muses to himself: "Biology can serve so well in making this a richer life. I wonder what we can do this year to make Pleasant Valley a better community in which to live?" You see, teacher Jones thinks of science as a *tool* to be used by people—and not only to be used by grown-ups, but by boys and girls, too.

What needs to be done in Pleasant Valley most urgently? Immediately he thinks of the campus which surrounds the new building. The bond issue and the school-building fund have allowed almost nothing for improving the grounds after the completion of the building. Well, of course, there is some likelihood that by next spring or summer, the P. T. A. may be able to raise enough money to begin an improvement project. This summer, however, everyone has concentrated on getting the interior of the building ready for classes by the opening of school.

Through his windows Jones can see most of the school yard. This land was part of a pasture before the school district purchased it—a poor pasture at that. A ledge of limestone outcropping over there, a scattering of limestone and chert boulders covering the ground

everywhere, a few scraggly buckbrush bushes here and there, clumps of ironweed and thistle at odd intervals, and five or six bois d'arc trees in the far corner. Not much pleasure in looking at that background!

Ah! There is an urgent need for Pleasant Valley! What other problem in the community is so imperative for the six hundred pupils and their parents? And what other school groups would be such logical leaders in "Landscaping the School Campus" as the four biology classes? And maybe the general-science classes, too? But perhaps no one else feels this need as urgently as the zealous Donald Jones. "I'll sound out a few of the boys and girls," he reflects. "If they're not concerned about the drabness of the grounds, it would be hard to make this project succeed. If they *are* concerned already, then I know that their enthusiasm only needs a little guidance."

IT doesn't take teacher Jones long to discover that the need has already been realized. At the biweekly Lions Club luncheon, a parent says to Jones: "Well, Don, it won't be long now until you'll be back in harness again. I'll bet you're looking forward to the new building." And Donald can reply truthfully, "Yes, I really am. It's one of the best school plants I've ever been in."

The parent continues, "Don't you think they'll do something about the school grounds this fall? My boy, Jim, said only yesterday that he thought it was a shame that the campus wasn't fixed up, too. You know, he's getting to the age now where he notices such things. And, then, I also overheard my niece, Mary, on the same subject. She said: 'Why, it's just like putting a gunny-sack on the football queen during home-coming time!' You can't beat these youngsters for saying things directly, can you?"

Well, there's one clue for Jones that the need is really felt. But he discovers that many other boys and girls feel the same way about the campus. Yes, all that is needed is to fan the seeds of discontent and do it while the pride in the new building is at its highest peak. Do it carefully, though, because there must be no destructive criticism or abuse of school authorities. Let's make it a problem for the school to solve, and let's solve it by our very best methods.

Problem-solving? Right! That's the answer. We'll handle this problem just the way great scientists have always solved the particular problems they had. Only, we'll do it collectively. Our biology classes can take the leadership, but we'll have to secure the help of the whole student body and the school staff. Money? Well, we'll have to figure that out, but we won't draw upon the P.T.A. or the school board for financial help. . . . So mused Donald Jones as he stood on the threshold of a brand-new school year.

THE reader can guess what happened from this point on. After some preliminary discussions on the problem (aided by a field trip to the school grounds, made ostensibly to discover specimens needed for some early laboratory study), a central committee from Mr. Jones's four biology classes was set up. A representative from his general-science class was added later, after that class clamored for permission to help. This committee was charged with the responsibility of dividing the various duties among the classes and of keeping all pupils informed of decisions reached in the separate classes.

Early in the term, it was decided that the classes would compete in their efforts to solve various aspects of the problem. Class competition was used as a means of achieving tangible results along desirable lines, but the compe-

tition was kept desirable by making it instrumental to the larger collective effort. The sense of belongingness, which so strongly determines what an adolescent will do with his energies, was submerged into the whole project.

Mr. Jones guided the discussions, the planning, and the actual physical work by a pattern strangely similar to that of the "scientific method." The need had already been sensed; so the *first step* was a careful definition of the problem. What actually needed to be done to the grounds? Who should do the work? Who would finance it? What physical changes would have to be made in the surface of the campus? What plants should be used in landscaping? Should other things be used for landscaping besides plants (rock gardens and sunken pools, for instance)? Actually, this was a series of interrelated problems, each of which had to be attacked in the light of others.

AT this point, the reader may like to examine the aptness of the approach used by Donald Jones and his neophyte scientists. Compare them, for example, with the following characteristics of a good problem:

1. The problem should be at or near the maturity level of the pupil.
2. The problem should be stated clearly and concisely.
3. The problem should not be too broad and inclusive.
4. The problem should be properly delimited.
5. The problem should, in general, be possible of solution with materials at hand.
6. The problem should be worth while for the learner.
7. The problem should be a part of an enlarging understanding.[1]

Such a comparison should not lessen the respect for the procedures used in Pleasant Valley High School!

[1] Heiss, Elwood D.; Obourn, Ellsworth S.; and Hoffman, C. Wesley, *Modern Methods and Materials for Teaching Science*. New York: The Macmillan Company, 1940, p. 37.

The *second step* was the collection of evidence bearing on the problems. Here was the point where most of the time for the early discussions by committees and classes was used. The enthusiasm of the boys and girls moved on and on—spurred by both the extrinsic rewards of the class competition and the intrinsic purpose of the problem that was being solved. Books were consulted, field trips made, experts called, other school departments contacted—all with the purpose of gathering as much data as possible.

The *third step* in the scientific method is to establish tentative hypotheses. With a mass of data on hand, the pupils were now prepared to make certain proposals. All of these decisions were not reached at the same time because the trial of some of the hypotheses was prerequisite to the selection of others. For example, it had to be decided whether a rock garden was to be included before a decision could be reached about the disposal of the loose rocks on the surface.

The *fourth step* in the scientific method is to test the hypotheses by the best means available for the immediate situation. This step was accomplished in the Pleasant Valley High School in two ways: (1) taking the proposals previously selected to the proper authorities for approval (as in the case of certain recommended physical changes in the ground surface, in the matter of financing, and in regard to the use of school time for certain of the work), and (2) actually trying out the landscaping proposals on the school grounds after the proper approvals were obtained.

The *fifth step* is that of drawing conclusions and generalizing. At Pleasant Valley, the conclusions were evident before the end of the school term. Yes, the campus *was* a changed place—this was the consensus of all who saw it. A beautiful rock garden with colorful

goldfish and water lilies occupied a space that had previously been an ugly sinkhole. Here was a bed of wild flowers and moss taken from the deep woods some miles distant from Pleasant Valley. Over there was a sundial, surrounded by a bed of crushed limestone rock. An asphalt walk meandered artistically from beauty spot to beauty spot. All of this beauty had been created at a minimum of actual cost—and this cost had been defrayed by student activities and benefit performances.

Yes, admittedly there would be changes made in the landscaping from year to year. It was amateurish, some parts done hurriedly. But it was a learning experience. Never forget that. We would not want to shield pupils from all mistakes, even if we knew how to prevent them.

BUT what about the fundamentals of biology? Mr. Jones had few doubts here. By June, he was convinced that his pupils had learned all of the fundamental generalizations which they needed to know, that they had acquired a wealth of laboratory skills, that they were much more observant of nature than ever before, that they appreciated the problems of conservation of plants and animals better than any classes he had even had, and that when the time came to build or buy their own homes they would have the desire and the know-how to make their homes models of landscaping which would make their neighborhood attractive to visitors and pleasing to themselves (This is the *final step* in problem-solving: application of principles to new situations.)

But what about learning to use the scientific method? Aha! on that score, Mr. Jones had no doubts at all. Yes, his pupils knew how to use it; they knew all of the steps. They had used them in solving a real problem, and the results were visible each time that they approached their high-school campus. They had done more than read about how scientists used the scientific method. *They had lived with the scientific method* for a whole year. They would never forget it.

### The Physical Sciences and World Citizenship

"Physical science today has developed to a point where technology can take care of all of the needs of mankind; in other words, the struggle which grows out of a limited supply of natural resources is no longer necessary.

"Can it be accomplished? That is the question which human beings have to decide, not on the basis of technology, not on the basis of raw materials, but on the basis of social attitudes—on the basis of social morality, if you will. Every discovery that man has made offers him two opportunities: He can use it to destroy, or he can use it to conserve and to save. . . ."

"I am trying to summarize what I have said in this way: The only hope for the world, as I see it at any rate, is for us to become citizens of the world. There are two great forces pushing us on: First, the great destructive capacity which has come along with scientific development, which says, 'Be good or be damned!' And second, a great force that is creative in character, which says that man can have the good life if he will learn to create and not to destroy; if he can learn, in other words, to have a decent social morality—if he can become a world citizen."—R. G. GUSTAFSON, *University of Nebraska*, in THE NORTH CENTRAL ASSOCIATION QUARTERLY, Vol. XXII, No. 3 (January, 1948), pp. 283-284.

# Science and LIFE

Reported by RUTH E. MAGUIRE

**This article is the third in a series of reports by the California State Department of Education on its recent study of the use of current periodicals and other timely teaching techniques in improving instruction in the secondary schools of California. Reported by Ruth E. Maguire, research assistant for the study, and edited by Frank B. Lindsay, Assistant Superintendent of Public Instruction in California, the first two articles have reported the results in the fields of social studies and language arts. This article, which completes the series, discusses the findings in the teaching of the sciences. Sponsored by the State Department of Education and Stanford University, the study reported for the JOURNAL in the November, January, and April issues has made a contribution to the study of secondary education in California.**

ARTICLES appearing in previous issues of the JOURNAL have reported the endeavors of teachers of United States history and government and of English to utilize current periodicals, films, and recordings in their classwork. This third report deals with some of the twenty-two classes in science in twelve of the fifteen high schools that co-operated with the State Department of Education in a study of improvement of instruction. In three high schools, there were seven classes in biology with 202 students whose teachers participated in the project. Six of the high schools had nine sections of chemistry with 216 pupils enrolled. Four high schools provided five physics classes with a total of 105 students. And at Point Loma Senior High School in San Diego City, there were 23 pupils in a class of physical science, a survey course for upper grades.

Principal Lee L. Bloomenshine of Point Loma stated that the 950 boys and girls, enrolled in the spring of 1946, come from good American families, many of them Portuguese who have been in San Diego for two and three generations, for it is the home port of a large tuna-fishing fleet. The Army and Navy personnel is not of the "shifting" variety, he went on to say, and the children are mostly sons and daughters of career officers. Pupil intelligence is high, and academic subjects are given emphasis. There are few "problem cases" among the students. He was complimentary about the materials and services rendered by Time, Incorporated, in connection with the project and believed the study could do much to break down age-old departmental barriers within the high school.

Donald R. McKenney, the physical-science instructor, made the Science and Medicine sections of *Time* and *Life* required reading for his students, and a class discussion of these was held every week. One of these, on April 3, 1946, can illustrate the classroom use of current materials. Pupil discussion centered on two articles from *Time*—"Flying Eyes" about television, and "Consider the Termite." One pupil announced his conclusion after reading about termites, "If that's communism, not for me!" But the boys in this class of non-college preparatory students were more entertained by the "love life" of the termite and only reluctantly turned to a consideration of Winston

Churchill's reference to the analogies of termite social structure to political institutions abroad. Just previously, the class had viewed films on "The Behavior of Light," "Sound Waves and Their Sources," and "Men of Medicine"; the latter, a *March of Time* film, had proved of particular interest to the group. On the blackboard that day were questions based on a previous issue of *Time:*

1. What causes spring fever?
2. What do gamma rays do to people?
3. What is a bolometer?
4. Who is Dr. Hellmut de Terra?
5. What is your opinion of "One World or None"?

IT is interesting to contrast this somewhat incidental employment of current materials in teaching science with their utilization in a college-preparatory course in chemistry at Fortuna. Fortuna High School is at the other end of the coast of California in a lumbering and dairying region. Two-thirds of its 450 students are transported daily by buses from farms twenty to thirty miles from the school. Principal George J. Badura says of his students and the country in which he lives: "Fortuna is a typical small town where everybody knows what you ate for breakfast. In a school of this size, the students feel it is *their school,* and it is possible for teachers and students to know each other." Seventy-five per cent of them take agriculture, commercial subjects, homemaking, and industrial arts. But the 10 per cent of the graduates who enter colleges are markedly successful.

THE chemistry teacher, Stephen D. Coleman, kept a journal quoted here in part, which clearly shows his growth in a sense of the usefulness of bulletin-board displays, of the utilization of current and fugitive materials to relate chemistry to life and world affairs, and of the values of lively student participation in class discussions. Here are a few excerpts from his "Investigation Diary":

*January 29.* Outlined unit on sulfur. Talked of possible use of bulletin board. Class decided to have two students each week to be in charge of bulletin board. Schedule typed and posted on bulletin board. The first display to be posted February 11.

*January 30.* Placed four pictures on bulletin board about riveting. Topic had been discussed by class two weeks ago.

*January 31.* A number of voluntary reports have been prepared. Today, the following were presented: Rubber industry, from *Fortune*; Goodyear's life and work, based on *The Laboratory*; Production of rubber illustrated by film strip; Sulfur, based on *Fortune* article; "Three Story Tree Grafting," from *Science Digest.*

*February 5.* Gave current-affairs test. Eight questions had to do with science. Of nineteen students, six got six out of the eight correct; four gave right answers to five questions; seven got four (or half); and two knew three.

*February 7.* Removed pictures on riveting on February 5. During the week they were on display, I noticed only one student observing them. Asked class how many had looked at pictures closely; seven said they had. Today gave test of four questions based on the pictures. Scores: all four answered right by ten; three, by five students; one student could answer only two; another, only one; two students missed all four.

*February 11.* Clipped twenty pictures for bulletin board from 1944 *Fortune* on mining, electronics, rubber, and petroleum. The girls in charge of bulletin board have found difficulty in getting suitable material although they have put in a great deal of effort. There is still a scarcity of cut-out pictures available. Students encouraged to bring these in, but so far only two or three have. First display on uses of sulfuric acids. Well-arranged but pictures not particularly pertinent.

*February 12.* Issued Time of February 4 to students. Gave class questions based on Medicine and Science departments. Marjory volunteered to act as chairman for discussion tomorrow.

*February 13.* Excellent discussion under Marjory's leadership. Many new points brought out not mentioned in articles assigned. Breadth of knowledge and ability of students to retain facts and figures surprised me. Class afterward said how much they had enjoyed the hour. Topics covered during discussion: radar, sulfur, atomic bombs, the betatron.

*February 14.* Finished unit on sulfur.

*February 20.* Chemistry display on bulletin board not posted this week. Jerry and Kenneth were in charge.

*February 25.* Showed film, "Invaluable Ingredients." Good teaching aid on method of obtaining salt and its uses. Lois Sorenson presented paper on salt with samples and uses in industry.

*February 26.* Marjory showed some samples of nylon and gave talk that could have been much better. She spent considerable time in preparation, but believe she feels inferior to rest of class with regard to ability in chemistry. Many students now bringing in bulletin-board material. Our files are rapidly filling.

*February 27.* This past week, Russell and Dee posted information on DDT. At its close asked two questions about DDT. It is evident many did not examine display carefully. Barbara Black gave clear talk on war gases and their effects on the human body.

*March 1.* Graded DDT test. Questions asked on February 27: (a) Name *three* insects readily controlled by DDT; (b) Name *two* not killed by it. One student named five insects correctly. Three listed four right; two got two; one pupil knew none.

*March 7.* Bulletin-board display by Mariann and Marjory showed no extensive planning or execution. Thought for the future: have students who prepare display make a few comments to class, pointing out what the display represents, why they chose the topic, what class can gain from it. This may stimulate more preparation before bulletin board is posted.

*March 11.* Harold Neville talked on cork and its production.

*March 15.* Alice Gunnerson gave report on DDT and its uses.

*March 18.* Showed "Men of Medicine," *March of Time* film. Beforehand asked some students to look for disagreeable aspects of the medical profession; some to look for compensations; others to observe work of a doctor's assistant. Film served to show relationship between chemistry and medicine and to give guidance about medical occupations.

*March 19.* John Gianotti gave talk on streptomycin. Nadine Holsapple presented history of petroleum production and its uses.

*March 20.* Showed film "Hawaiian Harvest," about cane-sugar production, to introduce study of carbohydrates. Served its purpose very well. Also gave students an idea of type of work done by people who produce sugar.

*May 13.* "New Ways of Farming," *March of Time* film, presented during unit on nitrogen and agents that make up soil fertility. Particularly pertinent at this time when United States is feeding the world because this picture pointed out how much soil damage is done during and following a world war. Excellent film to emphasize necessity of soil conservation.

*May 17.* Today began study of atom and atomic energy. Little textbook material on subject; so am relying on articles from *Time, Life,* and *Fortune,* together with clippings from newspapers and kit called "Background to the Atomic Age."

*May 20.* Lorraine Raviscioni talked on background of atomic research up to beginning of Manhattan Project. Report on atom-smashing machines to be given later.

*May 21.* Two more reports based on *Fortune* article, "Physics of the Bomb." Although not everything is thoroughly grasped, students understand enough to get good background for further reading.

*May 22.* Talk on atom smasher from Yates's book of the same.

*May 23.* Panel discussion of question whether U. S. should keep secret all information on atomic energy. General discussion afterward rambled a good deal. However, by end of period, students had pretty well agreed all atomic information should be controlled by group of scientists chosen from all nations. In general, discussion was on a very mature level with little sarcasm, and there was due regard for opinions of others. Discussion leader kept students to topic.

*May 27.* Chemistry students asked about usefulness of bulletin board. Six said they had learned a great deal from the displays; six said they had been of considerable value to them; six thought not very much. One student felt he had learned practically nothing from the displays. Some students suggested more use of displays in class discussions and regular tests on the information they carry.

FOR her part in the study of improvement of instruction, Mrs. Helen M. Smeltzer, biology teacher at Pittsburg Senior High School, chose two groups of her students as a representative cross-section of the students. "One was a mixed class, heterogeneous in ability and school curricula, college-preparatory, commercial, and general. The range in intelligence quotients was from 63 to 124. The second group was more homogeneous, a higher proportion of

college-preparatory students with I.Q.'s from 67 to 126," she wrote. "Because our semester is divided into three grade periods of six weeks each, I divided the study into three large units. During the first six weeks, the class studied invertebrate animals, their relative position in the animal kingdom, and their importance to man. . . . The next unit was vertebrates. . . . And after the study of animals in general, the class wanted to know about themselves, the final unit in the course."

IN order to appreciate Mrs. Smeltzer's achievements in using current-magazine and film materials, one would have to know the boundless enthusiasm and resourcefulness she brings to every class each period of the day, as well as the composition of her student groups. To convey her teaching personality, her own summary can speak. But her pupils may be understood if we review a study which she made that year of the entire eleventh grade:

Pittsburg is like other towns in having parents and children; yet it is almost unique among California communities with respect to the stability of its population and the cultural backgrounds of its families. At the time this study of improvement of instruction was in operation, the high-school faculty had just been asking the questions: Who are our pupils? Why are they living here? How do their fathers earn their livings? And are our high-school courses really adequate to promote the health, economic understanding, and social and spiritual growth of our children?

The 190 members of the eleventh-year class that year typify the entire high school. Of these, 136 (72 per cent) had been born in Pittsburg; 33 (17 per cent) were born elsewhere in California; and only 21 (11 per cent) had other states as their birthplace. None had been born outside the United States. Yet the parents of these 190 pupils included 220 who were foreign-born, or nearly 60 per cent. Mexico led with 103; Italy sent 95; Greece, 7; England, 4. Others came from Brazil, Czechoslovakia, France, Germany, Poland, Rumania, and Yugoslavia. The 160 native-born parents came from twenty-nine states with 83 from California, 10 from Texas, 7 from Indiana, and 5 each from Colorado and Utah.

The language spoken at home has much bearing upon school achievement. Eighty-eight pupils had both parents foreign-born, and no English was spoken in the homes of 61 of these. Eight more came from homes where no English was spoken although one parent had been born in the United States. Sixty others were members of families where the most familiar speech was Greek, Italian, or Spanish.

NINETY of this class were of Italian parentage. Fifty-one came from homes where English commonly was spoken, and there were not more than four children per family; in fact, 29 of these had only one brother or sister. But 16 of the remainder who heard only Italian at home belonged to families of 6 to 12 children—the mode was 8. Of the 58 young people of Mexican parentage, three-fourths belonged to large families. When the parents were born outside the United States and did not speak English, again the mode was 8 and the median, 7.

Residents of Pittsburg are employed principally in the steel industry, the chemical and petroleum plants, or in fishing. It is the home port of one of the largest fishing fleets of the Pacific Coast. The confluence of river and sea fronting Pittsburg makes for one of the richest fishing beds on the Coast; but many fishermen sail into Alaskan waters. They take their sons with them, and often these boys do not return to enter school until some time after the term has opened. The fish canneries

also employ many of the women during the sardine season, and high-school pupils work after school or during a night shift.

Limitations in space permit only a few quotations from Mrs. Smeltzer's summary of the final unit, "Man in Structure and Function." "We set up the following as our objectives," she wrote after the introductory class meeting:

"To get a better knowledge of our bodies so that we can take better care of them.

To learn what foods we should eat to keep our bodies healthy.

To determine how we can improve our health habits through knowledge of the mechanics of digestion, circulation, respiration, and excretion.

To appreciate our social responsibility for the diet needs of less fortunte peoples in Europe and Asia.

To master a working vocabulary for the study of the human body."

"Ordinarily, I start the study of the human body with the skeletal and muscular systems; but in the spring of 1946, *Time* had excellent material on nutrition and the starving peoples of the world. Starting with *Time's* articles, the classes learned about nutritional needs and balanced diets. . . . As soon as the study of the function and the structure of the digestive system was completed, *Life* obliged us with a pictorial article on circulation; so again periodicals were the 'jumping-off place.' At this time also, there appeared newspaper reports of University of California experiments in tracing circulation for the first time in the history of man, and the questions asked by students led perfectly into a study of respiration. The excretory system followed; and we concluded with muscles, bones, posture, and the nervous system. Ductless glands occupied only a few days and were presented through the film, 'Ductless Glands,' and readings. Heredity and reproduction were left entirely to the bulletin board.

"Films were used to introduce the circulatory and nervous systems. These were preceded by an overview of contents, things to look for, and questions the students thought each should answer. When the film was shown, students took notes. Discussion followed, and then the film was shown again. A test on the unit followed.

"Students used the microscopes to examine their own blood and to watch the flow of blood through the caudal fin of our goldfish, which we anesthetized for the purpose. They also took their pulses before and after exercise.

"Our textbooks were used only as references—not assigned reading. This is necessary in a set-up such as mine where even simple English is a difficult task for many. Films on Dr. Jenner, 'Tracking the Sleeping Sickness' and *March of Time's* 'Men of Medicine' were used for appreciation and general discussion. One girl read *Microbe Hunters* and *Men Against Death.*

"I came to the following conclusions:

1. Students must be helped to read current materials; but once they get started, they enjoy this type of work.
2. Biology seems more meaningful to them when approached through current materials.
3. With my kind of students, textbooks must be supplemental aids.
4. Brighter students get more out of an enriched study than poorer ones.

"Another year, I will make the following changes:

1. Films will be used more freely in studying invertebrate and vertebrate animals.
2. Less time will be spent on invertebrates.
3. In vertebrate study, more time will be spent on animal habits and their importance to man and less on structure.
4. The study of the human body will be expanded in time.
5. Civic biology will occupy more time in the course and will be taught from current materials almost exclusively, including field trips."

NO account of the work of biology classes in the high schools cooperating in the study could be complete without reference to the teaching of Mrs. Anna L. Bigler at Sequoia Union High School in Redwood City. (Mrs. Bigler has taught in private and public schools from elementary grades through senior high school. She is now at Sequoia High School, which A. C. Argo, the superintendent of the district and principal, long ago made one of remarkable four-year secondary schools in the state and has maintained its standing by assembling an exceptional faculty.) According to a study of family

backgrounds reported by James W. Thornton, Jr., who was director of curriculum at the time of the study: "At present [1946], our students come from homes occupationally and economically above the national average, a predominantly urban group, with skills and training well above the national average." Over 70 per cent of the fathers of the students are San Francisco commuters who live down the Peninsula but are engaged in professional, managerial, clerical, and skilled-trade occupations. There are a few farmers of small acreages.

Mrs. Bigler emphasized to her students that this was *their* project. With her guidance, they worked out the following objectives for their "Biology Workshop."

"1. To keep abreast of current scientific progress through (a) national magazines, (b) radio programs, and (c) movies.

2. To learn to use available materials, such as (a) magazines, (b) maps, (c) bulletin boards, (d) actual specimens, and (e) class demonstrations.

3. To learn how to look up information objectively and successfully.

4. To learn to read critically and to present findings to the group."

At one time, the class allocated these projects among themselves:

(a) 'Better Living Through Science,' a collection of clippings, drawings, and pictures to be assembled;

(b) a bird booklet, to be made of drawings and pictures of birds in the vicinity, with identification quizzes on certain days;

(c) a 'science-word corner' to which words taken mostly from *Time* and *Life* will be added each week and class members held for meaning; and

(d) a bulletin board with several committees alternately in charge."

At the close of the semester, Mrs. Bigler submitted these comments made by her students:

"We have come to recognize and read more articles of biological interest in leading magazines. Before, we probably would not have bothered to look for them."

"We have learned to work together in committees. We have overcome self-consciousness when we get up in front of people."

"I think the workshop idea is good because it gives students a chance to find their own answers and not be helped too much."

"I think the workshop helps us to feel that we are getting things done in one day instead of having to wait until tomorrow to talk about what we are interested in."

NOT all the students liked the departure from textbook assignments. But one student who expressed herself as unfavorable to the workshop became so interested in heredity from charts posted on the bulletin board that she spent an entire Saturday afternoon at the public library and wrote a booklet of her findings for the class. A parent became so interested that she gave the class a complete file of *National Geographics* for the past forty years; her husband made a case to house the science articles, and their child organized them under appropriate headings.

Kearney Junior-Senior High School in San Diego is proud that it was named for General Stephen Kearney, whose forces crossed the mesa in 1846 to establish themselves in San Diego to hold it for the United States. But few of its 1,000 students were descendants of early Californians. The high school began in 1941 when the largest federal war-housing project in the country was authorized to shelter the families of workers in the war industries of the area. In Principal Edward C. Taylor, the Superintendent of San Diego City Schools, Will C. Crawford, found the right man to direct the educational program for children drawn from many states and most divergent home backgrounds. And Miles M. Miller, instructor in chemistry and physics, has applied the school's philosophy to his students and subjects.

"Education is well likened to the process of growing up in that it is not done all at once and often not in any real

sequence," said Miller. "And ideas and opinions are the products of garnered facts and reasoned thinking, built as a stone wall is built—a little at a time and the pieces brought from many different places. These classes in physics and chemistry were mixed juniors and seniors with intelligence quotients ranging from 84 to 125 and in ages 16 to 22 years. No pupil had lived in the school district for more than four years. The majority had had their earlier training in other states; some had had schooling in as many as five states, as their folks moved around for work.

"*Time* and *Life* were used for teaching. Many times not on the next topic at hand in the textbooks; at other times, they give *additional* or *new* information not yet in the books. Sometimes the magazines gave *variation* to add life to class work. In both classes, we usually knew where we wanted to go, but sometimes the route we took was a bit circuitous; the magazines helped us to our goals.

"Three-quarters of the class said they had learned more than they had expected from magazines; only one student felt they were unprofitable as study material. Every parent said he felt the current magazines had a place in science classes and that his child read them without prodding."

A READING consultant working from the central city office attended the physics class for eight consecutive days, at a time when the students were giving oral reports. Her comments will serve as conclusions to be drawn from the science classes co-operating in this study of improvement of instruction.

"As students in physics are somewhat selected, none seemed to have difficulty in reading the articles.

"Tests showed that growth in reading increased more than eight months in one semester.

"Class discussions were friendly and animated. The fact that the material was fresh for both teacher and students gave life to the class and helped to establish a fine attitude of sharing between teacher and class. Informality of discussion was always accompanied by close attention to issues of importance.

"Students showed growth in ability to think through issues carefully. Careless or sloppy thinking was quickly detected by someone and corrected in a friendly spirit.

"The correlation between theory and real life situations was clarified for the students. They were serious and searched daily for more understanding of basic principles behind scientific inventions and events in the world around us.

"The study of advertisements made the class conscious of new products on the market and the significant part that science is playing in the development of means for better living.

"This plan offers an excellent opportunity for guidance in magazine reading. The class definitely showed growth in ability to select significant items for class discussions. Only a few tended to pick sensational or trivial items."

## Readjustment of Education to the Atomic Age

"We must not train children for the world as it is now. It will not stay like this very long. Nor can we, of course, train them for the unknown conditions that they will see in the closing years of this century. Our only recourse is to educate them to the inevitability of change. Change is a part of the order of nature. It was a slow process in the days of our ancestors. Nothing much happened in a single century. But now we have 100,000 scientists in the laboratories of this country alone, spending about one billion dollars a year on research and for the very purpose of changing the way we live. Let no one be surprised if a change results and let no child grow up without being conditioned to change. It is the surest thing that they will find in the years to come, and it is the cruelest indictment of our education that we not only fail to prepare for future changes, but seldom even take into account changes that have already happened."—GERALD WENDT, *Editorial Director*, SCIENCE ILLUSTRATED, at Seventy-Fourth Annual Convention of the American Association of School Administrators, Atlantic City, February 21-26, 1948.

## Forecasts for Science Teachers

Science teachers of the future may expect to receive more and better educational material, prepared by industrial firms for classroom use. They may experience increasing interest on the part of adults in their communities in the progress of young people interested in science. They may even anticipate better working conditions in respect to their teaching loads, more time for laboratory preparations, and opportunities for refreshing their scientific spirits in well-planned workshops. It is even possible that better pay may become a recognition of special skill and training.

All of these matters were discussed at meetings of the National Science Teachers Association in Chicago in December, 1947, in conjunction with the annual program of the American Association for the Advancement of Science, with which the science teachers' organization is affiliated.

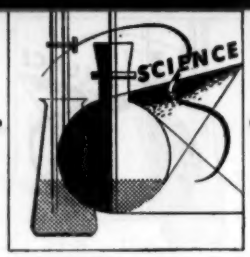
At a conference of approximately one hundred educational directors and public-relations counselors from widely-diversified industries, and an equal number of science teachers, the appointment of the new Advisory Council on Industry-Science Teaching Relations was authorized. This new council, composed of members from industry and education, will plan an expansion of the services of industry to science teaching. It will develop methods of testing the effectiveness of the industrial material and of training science teachers in its use. It will devise the means of financing the preparation, production, and distribution of a continuous supply of up-to-date bulletins, charts, displays, films, and other items of high educational value.

The growth of Junior Academies of Science in many states throughout the nation has directed the attention of mature scientists to the enthusiasm of young persons for science. The many Science Fairs, Science Congresses, and Science Assemblies in which the participants are exclusively young people have already challenged the interest and the sponsorship of civic clubs, newspapers, and other adult organizations. Alert science teachers are discovering the possibilities of arousing public interest by these displays and demonstrations. The nation-wide interest on the part of high-school seniors in the annual Westinghouse Science Talent Searches, and the subsequent State Science Talent Searches now conducted in at least a dozen states, has provided a new method of selection for scholarships in college science departments. The concept is spreading that the trained scientists of the future, so important to our nation's security and prosperity, should be discovered in the public schools at as early a grade level as possible and given every opportunity to become highly expert in some scientific specialty.

Programs of this nature require a close co-operation between education-minded citizens, principals, and teachers, both in communities and in regions.

Responsibility for planning our nation's future science courses has been accepted in high places. As part of the program of the President's Scientific Research Board, the Cooperative Committee on the Teaching of Science and Mathematics (appointed by the American Association for the Advancement of Science) has made an exhaustive study of the teaching conditions in these fields. This Committee's report, entitled "The Effectiveness of Science Teaching," was presented at a forum meeting on December 28 in two parts—the first part dealing with science and mathematics in the twelve grades of the public schools and the second part with the program of science teaching in colleges and universities. The entire report is published as Appendix II of Volume IV of the Steelman Report of President Truman, entitled "Manpower for Research."

Among the recommendations included in the report are those for increasing the supply of well-trained science teachers at all levels and for giving these teachers continuous opportunities to enlarge their information in both science subject matter and teaching methods. Among these plans are science workshops that would provide for teacher-subsistence during the sessions and the employment of




counselors throughout the nation in each of the fields of mathematics, life science, and physical science.

The curriculum problem of presenting science for general education, in contrast with science for specialized scientific vocations, has received much attention in the discussions at the recent science teachers' meeting. A general program, planned as a requirement for all students, implies a three-year sequence in high school, consisting of general science, biology, and physical science (*not* physics and chemistry separately). At the level of college freshmen, the widespread policy of broad survey or "core" courses in science received special attention as to subject matter, teaching methods, equipment, and testing. The training of instructors for these broad courses constitutes a problem, for the topics usually include elementary astronomy, meteorology, geology, and the like—with which narrowly-trained specialists in science are not acquainted.

The current activities of the science teachers' group involves frequent distribution packets of carefully-selected industrial bulletins to all members. Another project is the production of professional booklets of a practical nature. One recently published is entitled "Time for Science Teaching." It contains thirteen chapters by as many authors on the various duties of a science teacher, including how to budget time for the performance of the most essential tasks. Many science teachers face problems of too little time for all that they are expected to do. The bulletin contains many suggestions to administrators, as well as to science teachers.

Two bulletins are scheduled for publication in 1948. One is tentatively titled "The Work Week of the Science Teachers"; the other, "Teaching Science in New York State." Each of these will consider the outside duties of science teachers, as well as their classroom and laboratory activities.

Additional bulletins are under consideration by a committee of the National Science Teachers Association. Their topics include science classrooms and laboratories, the use of audio-visual equipment, a science library service, arrangements for field stations in various parts of the nation for outdoor science workshops, and other practical publications that may be distributed widely among science teachers.—*Contributed by the National Science Teachers Association, 1201 Sixteenth Street, N. W., Washington, D. C.*

●

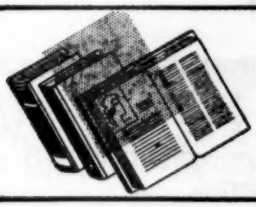
## Descriptions of Scientific Professions

Have you seen the Description of Professions Series, issued by the U. S. Employment Service, Department of Labor? Originally printed on folders composed of cards, these descriptions of sixty-nine professions are now available in pamphlet form. Those who are teaching in the field of sciences will be particularly interested in Pamphlet No. 1—"Agricultural and Biological Sciences" ($0.15); Pamphlet No. 2—"Engineering Sciences" ($0.15); and Pamphlet No. 6—"Physical Sciences" ($0.10). The seven pamphlets, which are now available, may be secured from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

●

## Bibliography on Atomic Energy

A list of 275 selected annotated references on atomic energy for schools and discussion groups is available from the Bureau of Publications, Teachers College, Columbia University, New York 27, New York (29 pp. Litho. $0.35). Israel Light has grouped the references according to these topics: science and society; bibliographies; books—technical-scientific, nontechnical, nonfiction, fiction, and plays; pamphlets; periodicals and newspapers; special series; and documents.



# Book Reviews

BASIC CHEMISTRY. *Ernest E. Bayles and Arthur L. Mills.* New York: Macmillan Company, 1947. Pp. xii + 720.

"BASIC CHEMISTRY" is a well-written text, designed primarily for college-preparatory, high-school classes and yet presented in a manner that would make the student aware of the vital part chemistry plays in everyday life. The text is organized on the unit basis, and the title of each unit and chapter consists of a question which forms central theme for the unit.

The functionalism of this approach can best be illustrated by listing the units as they appear: (1) What is the nature of a scientific study of chemistry? (2) What happens to matter when it undergoes chemical change? (3) What happens when substances mix, especially with water, without changing chemically? (4) How does a chemist represent chemical change? (5) What should we believe today about the subatomic structure of matter? (6) How does the concept of ionization help us understand chemical reactions? (7) Can the elements be arranged in groups useful for predicting their properties? (8) What part do the nonmetals, nitrogen and sulphur, play in the affairs of the world? (9) How do the organic compounds differ from the inorganic? (10) What is the present and the probable future significance of chemistry?

The book contains a modern treatment of plastics, drugs, fuels, and foods. Meggers' 1947 revision of the periodic elements (giving 96 elements) is included. There is a brief discussion of the atomic bomb. The historical approach is used in the introduction of some topics and several interest-arousing incidents, such as Kekule's dream of the dancing "atom-like elves" and the benzene ring, are brought in at appropriate places. The book differs from most chemistry texts in the following: (1) Tool topics of chemistry are treated in the first four chapters. (2) Colloids are studied early along with mixtures. (3) Questions accompany many of the illustrations.

The references, questions, and problems accompanying each chapter are adequate, and the glossary and index are good. A manual of laboratory experiments and exercises is available. Although the illustrations are numerous and well selected, the poor quality of paper causes the black-and-white reproductions to show through on the reverse side.

* * *

BIOLOGY AND HUMAN AFFAIRS. New Edition. *By John W. Ritchie.* Yonkers 5: World Book Company, 1948. Pp. xiv + 818.

RECOGNIZING that only a small percentage of the students enrolled in high-school biology will ever become professional biologists, the author pre-

**Reviews for this issue of the JOURNAL are contributed by three members of the staff of San Francisco State College, each representing different subject-matter fields.**

**The first two books are reviewed by Arthur J. Hall, Instructor in Mathematics, San Francisco State College. Mr. Hall previously taught science at Menlo Junior College, and in public high schools in the Midwest. His major assignment during the recent war was as an air-navigation instructor in the Navy.**

sents an outstanding offering in cultural and utilitarian biology. Under unit headings, the text covers a comprehensive outline of biology fairly completely. Such topics as ecology, parasitology, heredity, physiology, and evolution are treated in a most understandable fashion, and on a level of abstraction which is within the scope of most students' understanding. These topics and others are not presented as cold, isolated, scientific facts, but as vital, scientific knowledge with social implications for and applications to everyday affairs.

The unit entitled "Change in Living Things" is an excellent account of elementary paleontology. Reproduction is approached from the standpoint of breeding farm animals and developing food-producing plants. The unit on "behavior" consists of several noteworthy topics, e. g., the importance of emotions, and the discussion of important factors controlling human behavior. The closing unit of the text is worthy of special praise. This unit, entitled "Our Biology Course," introduces noted men of biology not previously mentioned, applications of biology to the administration of our public domain, some important social traits of man, and a discussion of the question: "Is the Constitution of the United States a sound biological document?"

Although at first glance it might appear that some topics are too difficult, it is claimed (and justly so) by the author that the nontechnical vocabulary has been checked against the Thorndike-Lorge *Teacher's Word Book* and found to be below the tenth-grade level in difficulty.

Subjective unit-comprehension tests, suggested activities and applications with references follow each unit.

The mechanical aspects of the text leave nothing to be desired. The illustrations are numerous, well chosen, and appealing. The appendix contains a classification of the animal and plant kingdoms, a geological time chart, and a glossary of terms.

* * *

PUBLIC SCHOOL ADMINISTRATION. *By Jesse B. Sears.* New York 10: The Ronald Press, 1947. Pp. xi + 433.

THIS book by Professor Emeritus Sears of Stanford is a significant contribution to the field of public-school administration. It does not propound the way in which schools should be organized and administered, but it stresses the underlying purposes of administration and its relationship to the general field of education as well as to the social scene in which schools are administered. The book aims to present concepts and materials which will produce educational leaders and statesmen rather than educational mechanics and technicians. It stresses "how to find out how to administer." Inasmuch as it is a reference book of the self-improvement variety, every administrator should have a copy at hand.

One of the strongest features of the book is the inclusion of selected bibliographies based upon related literature. These are sufficiently extensive and comprehensive to enable one to realize and to learn to appreciate the manifold responsibilities of the school administrator.

---

**Dr. A. B. Murphy, who reviews Dr. Sears' book for the JOURNAL, spent many years as high-school principal and superintendent of schools in the Rocky Mountain region before coming to California. He is associate professor of education in the field of administration at San Francisco State College. He has published articles in the field of teacher tenure.**

Part I, stresses the research tools and materials needed in school administration. The bibliographies include general guides to reference materials, dictionaries, encyclopedias, indices, guides, reviews, directories, handbooks, and research methods and techniques. Bibliographies on the background of school administration include history of education, philosophy of education, educational sociology, and educational psychology. A list of professional organizations, journals, reference books, and documents is also presented.

Part II, the literature and problems of public school administration, consists of eleven chapters covering briefly the theories of public school administration, the Federal Government and education, state school administration, county and rural schools, financing public education, local school administration, personnel management, supervision and research, school business management, school buildings, and the administration of a school. A carefully selected and rather extensive bibliography is included with each topic.

* * *

THE FUNDAMENTALS OF BUSINESS TRAINING. *By Raymond C. Goodfellow.* New York 11: The Macmillan Company, 1940. Pp. xiv + 515. $2.00.

GOODFELLOW has given ninth-year pupils a book far more stimulating than its drab title implies. Although embodying a wealth of information about the business world, *The Fundamentals of Business Training* has been written for a course that is taught for personal use and not for vocational purposes. This textbook really caters to the needs and interests of the pupils. They should easily understand the material because it is presented simply, carefully, and logically.

Always considerate of the pupil's world, the author explores nearly every important phase of personal business. In the chapter "Personal Relations in the World Today," as well as in other parts of the book, Goodfellow also emphasizes the significance of personality, character, and citizenship. Among the business topics that he discusses especially effectively are: the objectives of insurance, insurance policies, and their major provisions; forms of ownership, functions of a business enterprise, and the techniques of applying for employment; savings, home ownership, and other investments; using the bank; travel facilities and procedures to follow in traveling; using the telephone and the telegraph. Considerable consumer education has been included. There is, for example, a good exposition of buying problems, the major consumer services and sources of information.

Several attractive features enhance the likelihood of pupil motivation and learning. Chichi Lasley's apt and humorous line drawings will appeal to both teachers and students. Many photographic illustrations complement the textual material. Learning aids include useful chapter summaries and suggested activities such as quiz programs, spelling bees, job sheets, and emphasis upon the three R's.

Useful as the book may be, it is not without weaknesses. Occasionally the author emphasizes unduly the need for

**As a teacher of business at Menlo Junior College and later at Santa Rosa Junior College, before joining the staff of San Francisco State College as Assistant Professor of Commerce, George Feliz has had a broad background of experience in this field against which to evaluate these two business-education texts. These reviews form a follow-up to the symposium on problems in the teaching of business education, which appeared in the March issue of the JOURNAL.**

"advancement" (p. 258). Perhaps it would have been better to encourage the student only to attain maximum self-development. Seemingly, also the final chapter is too comprehensive, with its treatment of self-analysis, business vocations, contribution to the community, citizenship, and a philosophy of life. It is doubtful that the meaning of this chapter could be taught effectively to ninth-year pupils in business training. In the discussion of money, the function of gold in our economy is not explained adequately. It is mentioned as being well adapted for use as money, but the student may well wonder why it is not circulated as money.

"Selling in the World of Today" (Chapter XIII) contains considerable repetition of material presented in the earlier chapter on personal relations. Perhaps elimination of such repetition would have conserved sufficient space for a brief treatment of the book's most conspicuous omission—a discussion of labor unions and union membership. Certainly many pupils in business training will become union members, and as such will contribute to the production of goods and services in our society.

These few deficiencies easily could be overcome in using the book as a text. A carefully planned work, written in a lively conversational style, *Fundamentals of Business Training* should appeal to many teachers and supervisors.

* * *

The Consumer's Economic Life. *By Jessie Graham and Lloyd L. Jones.* New York: The Gregg Publishing Company, 1946. Pp. x + 555.

NOTWITHSTANDING the widespread discussion of consumer education during the past fifteen years, few good books in this field have been written for pupils in the secondary schools. Graham and Jones have made an important contribution to the textbook literature in this area. With objectivity and logic, they contend that consumers must learn to help themselves and to support scrupulous businessmen. Admittedly a middle-of-the-road presentation, the text gives suggestions and detailed information that should help any consumer.

The thorough treatment of buying problems is the book's outstanding merit. After being introduced to buying principles, the reader learns many facts and techniques that will aid him in buying and consuming food, beverages, fabrics, clothing, cosmetics, household equipment, travel accommodations, school supplies, and other items. Sections on nutrition and grooming aids augment this part of the book. Related discussions deal with the maintenance and careful operation of automobiles, the renting and buying of homes, insurance, budgeting, and credit.

Under the heading of "Buyer, Beware," Graham and Jones point out the pitfalls for consumers. But elsewhere the authors emphasize that consumers must assume responsibility for becoming informed, for getting their money's worth, and for aiding in the establishment of higher standards for business. Briefly presented are consumer organizations, business groups serving consumers, and laws and governmental provision for their protection. The appendix supplements this section by describing the functions and important publications of many professional, trade, and governmental services.

Although Graham and Jones deal effectively with the day-to-day problems of consumption, probably they fail in their attempt to give the pupil an understanding of the American economic system. The structure of the economy, the theory of price determination, and the nature of monopoly are complex topics. It is questionable whether generalizations and theoretical concepts will contribute much to the understanding

of the student. If teachers using this text desire to discuss these broader economic problems, they will need to draw upon more detailed references.

The description of educational services appears to be a warranted extension of the often more limited concept of consumer education. However, this material, together with the later section on selecting an occupation, is likely to be valuable only if the pupil has access to adequate guidance facilities.

At the end of each section are arithmetic problems that are related to the discussions. Words to study, study guides, and social-business questions also appear throughout the text. Other teaching-learning aids include a workbook and a teacher's manual.

*The Consumer's Economic Life* provides a wide range of information that consumers need. Although primarily useful as a text, its materials could be integrated with those used in other parts of the curriculum. Certainly, the volume should be examined by any teacher interested in consumer education in the secondary schools.

## Science-Education Workshops

The February issue of *Education* is devoted to a discussion of workshops in science education, including a foreword and thirteen articles. Each author tells of first-hand experiences as a participant, a consultant, or a director of a recent workshop. There is much variety, for certain workshops were planned for teachers in elementary grades; others, for high-school instructors. Some met in a community's schools; while others were offered on university campuses. The varied purposes were discovering new sources of instructional material; testing new experiments; revising science curricula; planning a long-range testing program. Two workshops wrote state bulletins for science teachers. One specialized in the problems of living in a large city, particularly the problem of how a science teacher might inform himself of these by first-hand investigations. Another dealt with the conditions of an agricultural community. A special study of "common learnings in science" came from the Curriculum Research Director of the Kansas City (Mo.) public schools. The "high-school science-teacher's dream" of a summer course in the laboratories of the General Electric Company at Schenectady and Cleveland is described as an awakened reality.

Many practical suggestions concerning the organization and the conduct of a science-education workshop are given. One of the most detailed is from an expert in the U. S. Office of Education. Another is written by a Virginia supervisor who has been active in more than a dozen workshops. The philosophies behind educational workshops in general, and science-education workshops in particular, are not neglected; these are offered in articles describing plans developed in Teachers College of Columbia University, the University of Chicago, Colorado College of Education, San Francisco State College, San Jose State College, Syracuse University, and University of Maine, New York University, the University of Florida, and others.

Single copies of the Science Education Workshop issue of *Education* may be secured for fifty cents from The Palmer Company, Publishers, 370 Atlantic Avenue, Boston 10, Mass.

# California's Needs in Higher Education

By GEORGE D. STRAYER

**Because of the nation-wide scope of his work in education, Dr. Strayer needs no introduction to the readers of the JOURNAL. His present activities in California stem from a bill passed at the 1947 session of the Legislature, which provided for a study of present and future needs of California for education above the high school level, with particular reference to each area of the state. The California State Department of Education and the Regents of the University of California were authorized to make the necessary survey, and were directed to submit a report for consideration at the 1948 session of the Legislature.**

**Acting on this authority, the Regents and the State Department of Education appointed a Liaison Committee, which in turn appointed a Committee for the Survey of the Needs of California in Higher Education, with Dr. Strayer as chairman. The report of the latter committee is summarized in this article.**

THE act of the Legislature providing for a comprehensive survey of the system of publicly-supported higher education in California included the junior colleges, the state colleges, and the University of California. The bill required that a report be made concerning the emergency needs in Los Angeles County and in Sacramento County. In this same 1947 session, the Legislature established four-year colleges in Sacramento and in Los Angeles temporarily associated with the junior colleges in these cities, subject to further consideration when the report of the survey was made available to the Legislature.

The need for expanding the facilities in higher education has been recognized by the Regents of the University of California and by the State Board of Education. Several bills were introduced in the 1947 session of the Legislature which called for the expansion of junior colleges into four-year colleges. It was even proposed that any junior college be permitted to offer the upper-division work of the standard four-year college.

California was well-provided with facilities in the field of higher education as little as seven years ago. An increase of 3,000,000 in the population of the State during the past seven years, together with the large enrollment of veterans, has caused an overcrowding of all of the institutions of higher education, particularly the several campuses of the University and the state colleges.

The junior colleges have provided for a large percentage of the increased population enrolled in institutions above high school. During the past year, they enrolled over 60,000 students. During this same year (1947-48), the University has enrolled on its several campuses a total of 42,667; while the state colleges have provided for 19,281. Private universities and colleges enrolled 48,425 during the current year. The private junior colleges took care of 1,066. The total of students enrolled in institutions above the high-school grade on October 1, 1947 was 171,785.

Careful studies of the probable increase in population, together with estimates of the number of veterans who

may be expected to enroll, indicate that there will be 221,257 students enrolled in 1950, of whom 92,650 will be veterans. By 1955, the number will be diminished because of the much smaller number of veterans to be enrolled at that time. The total estimated enrollment for 1955 is 183,803. By 1960, it is estimated that the enrollment in institutions above high-school grade will be approximately 228,000; and in 1965, 277,000.

The facilities now provided are, in almost every case, inadequate. A large percentage of the student body find classroom and laboratory space in temporary buildings. Reading rooms in the libraries are inadequate for present student population. If California is to maintain its system of higher education at the high level that it has achieved in the past, new institutions must be established, and a large investment must be made in the plant and in equipment in the institutions in which students are now enrolled.

THE Committee responsible for the Survey has unanimously recommended against the extension of any junior college to include the upper division of the four-year college program. In line with the platform adopted by the Junior College Association, the Committee points out the importance of maintaining the junior colleges for the purposes for which they were organized and which they now serve. It is the judgment of the members of the Committee that the expansion of any junior college would result in the abandonment of the unique functions of the junior college in favor of concentration upon the upper-division work. The Committee points out also that the expansion of any junior college into a four-year college could not but result in legislative action which would, in the next

| Area. | Public University. | State Colleges. | Public Junior Colleges. | Private Four-Year Colleges. | Private Junior Colleges. | Total. |
|---|---|---|---|---|---|---|
| 1. Sacramento | | | 9,275 | 1,340 | | |
| Davis | 3,500 | | | | | 16,615 |
| Sacramento (New) | | 2,500 | | | | |
| 2. North East | | | 275 | | | |
| Chico | | 2,000 | | | | 2,275 |
| 3. North West | | | | | | |
| Arcata | | 1,000 | | | | 1,000 |
| 4. S. F.—Oakland | | | 9,240 | 9,637 | 596 | |
| Berkeley | 20,000 | | | | | 44,473 |
| San Francisco | | 5,000 | | | | |
| 5. Penin.—San Jose | | | 6,230 | 8,994 | 355 | |
| San Jose | | 6,000 | | | | 21,579 |
| 6. Fresno | | 5,000 | 5,709 | | 26 | 10,735 |
| 7. Santa Barbara | | | 1,532 | 300 | | |
| Santa Barbara | 3,500 | | | | | 8,032 |
| Cal. Poly. | | 2,700 | | | | |
| 8. Los Angeles | | | 42,632 | 30,219 | 158 | |
| U. C. L. A. | 20,000 | | | | | 101,009 |
| City (New) | | 5,000 | | | | |
| County (New) | | 3,000 | | | | |
| 9. San Diego | | 5,000 | 2,530 | | | 7,530 |
| 10. Riverside—San Bernardino (New) | 1,500 | | 4,415 | 1,943 | 151 | 8,009 |
| Total | 48,500 | 37,200 | 81,838 | 52,433 | 1,286 | 221,257 |
| Percentage of Total Capacity by Institution | 21.56 | 16.89 | 37.16 | 23.81 | .58 | |

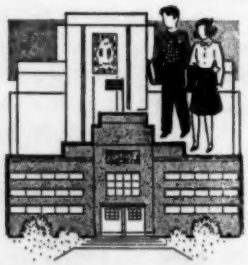
few years, mean the establishment of a great number of such institutions. This situation would lead to inadequate support of the state colleges and of the University and to the dilution of the quality of higher education in the State.

The study of the distribution of population among the ten areas of the State, together with an estimate of the number of students to be provided for, led the Committee to the conclusion that new state colleges were needed in the city of Los Angeles, in Sacramento, and in the area southeast of Los Angeles, including Orange County. To meet the further needs of students who may be expected to seek the type of program provided by the University, the Committee recommended the expansion of the offerings of the Davis campus to include a complete liberal-arts program. It recommended as well that a liberal-arts college to accommodate 1,500 students be developed on the Riverside campus.

Expansion of facilities required to accommodate the estimated student enrollment calls for the expansion of institutions now existing or to be established. (See table.)

IN order to accomplish this result, it is estimated that the State must make available for capital outlay, in addition to the amounts already funded for institutions of higher education, the sum of $73,000,000 for state colleges and $108,000,000 for the several campuses of the University.

The Survey Committee recommended that 2,000 subsistence scholarships be created of the value of $750 to be made available to able students who could not otherwise attend institutions of higher education because of lack of resources. It is recommended that these scholarships be administered jointly by the Regents of the University and by the State Department of Education. The Committee also recommended that 500 subsistence fellowships of the value of $1,000 a year be provided for students enrolled in the University in graduate and professional work. These fellowships are to be administered by the Regents of the University.



## A Unit on Education

For many years, schools have taught units upon communication, transportation, industry, Indians, and foreign countries; but they have neglected to sell the merits of education to future voters, taxpayers, and legislators while they are still in school. Therefore, a resource unit for use in secondary schools has been developed to impress students with the indispensability of education in a democratic society.

This unit was developed by an advanced graduate class at the University of Southern California under the direction of Dr. Emery Stoops and published by the California Teachers' Association, Southern Section. Copies of the unit may be secured without cost by addressing California Teachers' Association, Southern Section, 612 South Figueroa Street, Los Angeles 14, California.—EMERY STOOPS, *Administrative Assistant to the Los Angeles County Superintendent of Schools.*

# University Admission Thru Extension Courses

By E. T. DEMARS

**This report of a recent study of the admissions program of the University of California is published for California educators and others who are interested in evaluations of the University's admissions program.**

**The study reported dealt primarily with the deficiency-removal program operating in the Extension Division and with the scholastic achievement of the students enrolled in the Extension classes. The problem was to determine how well students with entrance deficiencies succeed both in the Extension Division and in the University and whether success in the University can be predicted from the records achieved in Extension.**

**This study was accepted as a doctor's thesis by the School of Education and by the Graduate Division. Both the study and this report were made by E. T. Demars, Assistant Professor, Educational Administration, University of Utah.**

ALTHOUGH entrance standards are high at the University of California, admission is not denied students who are lacking in the high-school subjects or the scholarship average required for entrance. Admission for these students is merely deferred until deficiencies are removed or until ability to carry university-grade work is demonstrated. Provision is made directly by the University for the removal of entrance deficiencies in a program of courses offered in University Extension.

About one-third of the students who apply for admission to the University of California have their admission deferred because of entrance deficiencies, and about one-fourth of these students enroll in Extension admissions classes to make up shortages. Between 1932 and 1947, 8,748 students have enrolled in these admissions classes. Sixteen per cent withdrew during their semester's work. Sixty-nine per cent achieved average grades of "C" or better in Extension classes, and 43 per cent entered the University.

The grade-point average of all admissions students in Extension was 1.28. The first-semester university average of these admissions students entering the University from 1933 to 1947 was 0.92. The average of all students admitted was 1.31. A "C" or higher average was achieved by 51.5 per cent of the admissions students in the first semester at the University.

About 32 per cent of the Extension admissions students entering the University graduate—about 13 per cent of the number originally enrolling in Extension classes.

Extension records cannot be used reliably to predict individual success of admissions students in the University. Average Extension grades show the highest degree of correlation with average first-semester University grades of all Extension grades taken singly or in groups (.50). Grades in Extension science courses correlate highest with average first-semester University grades of all Extension courses (.45), and the least correlation was found between grades in Subject A taken in Extension and first-semester University

averages (—.17). Average Extension grades combined with grades received in Zoology 10 or in English 1 taken in Extension show the highest degree of multiple correlation with average first-semester University grades (.61 and .57). Too much predictive significance cannot be attached to these coefficients of correlation, however, because of high Standard Errors of Estimate.

The regression equation which best shows the relationship between Extension and first-semester University grades is: University average equals .617 times the Extension average minus .04.

THROUGH the Extension admissions program, the University of California is able to provide a service of great merit to the people of California. It provides an avenue whereby all students may gain admission to the University by demonstrating ability to pursue university-grade work in the University Extension Division. The cost for this attempt to gain admission is borne largely by the students concerned. Through this and other programs, the University of California is maintaining high standards of scholarship and achievement without denying admission to deserving students.

## Enrollment in California Institutions of Higher Education

The Bureau of Readjustment Education, California State Department of Education, recently completed a survey of the total enrollment, as well as the enrollment of veterans, in California institutions that are approved to offer training to veterans under Public Law 346, as amended.

Based upon October (1947) enrollment, the data are considered both complete and accurate inasmuch as each of the 147 approved institutions of higher education responded to the questionnaire sent to them by the Bureau. (The total recognizes the public evening junior colleges of the State as separate reporting institutions.)

The total number of persons enrolled in the institutions of higher education in California is 215,810, of which number 92,208 have been identified as veterans. The enrollment of the day and evening junior colleges of the State is 103,359. Of this number, 65,620 are enrolled full-time, with 27,580 reported as veterans. There are many veterans enrolled in the junior colleges without educational benefits who have not been identified by the institutions as veterans, a situation which makes the total number of veterans listed incomplete.

The most critical problem facing prospective enrollees in educational institutions is housing. Many institutions report that it would be possible to enroll additional students with present facilities, but neither the schools nor the communities have housing for any appreciable number of additional students. Public and private institutions of higher education have stated they could enroll an additional 22,192 students in specific courses or fields of study but have housing facilities for only 16 per cent of this number.—A. C. Jensen, *Chief, Bureau of Readjustment Education, California State Department of Education.*

# Spelling–The Junior-High-School Handicap

By ANNE MALATESTA

**Now a housewife, mother of two boys, and a free-lance writer, Anne Malatesta was formerly a teacher in the Oakland Public Schools in English. Here, she discusses the problems which spelling presents in the study of the language arts in junior high school. Mrs. Malatesta is deeply concerned about what she considers the failure of the public schools to meet the oral and written needs of youth who graduate from our high schools. Her suggestions for stimulating interest in spelling and improving results in this field will interest educators; in fact, they may even startle some of us, particularly her suggested use of comic books. In relation to her comic-book techniques, readers will be interested in the results of the recent Stanford University study of the use of comic books, a brief account of which follows Mrs. Malatesta's article.**

WHEN a pupil comes to junior high school, the conscientious English teacher straightens her back, adjusts her bifocals, and grimly pounces on the misspelled words that make a travesty of his written composition work. She wonders how in the world the child could have sidestepped the correct spelling of so many common words. But too often the youngster is judged solely by the written page, the poorly-spelled paper giving a wrong impression to a new teacher. Often, the teacher thinks that her new charge comes from ignorant parents who don't give a hoot about the child's education. He is just one of forty-eight or more pupils in an overcrowded classroom, and she hasn't the time to go into his background. Thus, spelling often becomes a distinct handicap for the junior-high-school pupil.

Spelling may bring a pupil's grade down to a D in English. If he has a discerning teacher, in social studies, for example, she will give him an A in examination content, adding: "Your answers are excellent, but your spelling needs attention." On the other hand, another teacher might give him a C without further comment—so irritated with the misspelling that she has failed to note the excellent content.

What the junior-high-school teacher often doesn't take into consideration is that in many instances the child has had very little training in learning to build words in a phonetic sense. Calling spelling on the educational carpet may require going back to activities in the first grade, where reading is first introduced to the somewhat-bewildered first-grader and where sentences are hurled at him before he has any conception of sounds.

The spelling handicap is only too often thrown into the lap of the junior-high-school teacher, who, taking into consideration the lack of spelling foundation of a pupil, might profitably start from spelling scratch. In this way, many poor spellers might be given a second chance to hurdle that painful spelling-mile with a review of phonetics, of syllable separation, of word building, of dictionary word study, of pronounciation, and of other basic methods of teaching spelling.

THE present method in many schools of giving the average seventh-grader forty words to learn overnight and expecting him to know them the next day,

will not add many new spelling words to the poor speller's writing or spelling vocabulary. If he does learn a few of them, it will be by a hit-and-miss method. He may even achieve an occasional 100 per cent on his spelling test as a reward for his parrot-like memory work. But will the correct spelling be there when he needs to spell that particular word a month or a year from then? And so the student goes around in a vicious spelling circle, exposed year after year to new spelling words without first mastering the previous year's work.

Of course, some pupils have spelling sense, and others don't. To those who have, spelling words are mastered in an easy stride in spite of prevailing dull methods. But their spelling brothers have to take them in a somewhat more rugged rhythm, punctuated by a great deal of stumbling along the way. Fortunately, some students who don't get their spelling sense any other way, develop it in learning a foreign language. But here, too, there is a handicap in store for the poor speller. Often, he is excluded from taking a language course because it is considered "touch and go" with him. Once in the foreign-language course, however, he will progress in spelling, provided he has a teacher who really stretches beyond the point of mere teaching and insists that he learn to spell the English words as well as the foreign ones. Often, poor English spellers emerge as good spellers from a foreign-language course. They become spelling-conscious, a knack that many junior-high-school pupils have not acquired during their previous seven educational years. In addition, they are introduced to a long-needed phonetic sense.

But not all children take a language. There must be some other avenues of hope for the poor speller. The first avenue should be a spelling test, a requirement that all pupils entering junior-high school should take, covering the grammar-school work. Those who cannot make a passing grade on this test should be required to take a spelling course prepared especially for them.

Johnny might also be stopped in his spelling day-dreaming tracks by giving him something concrete to do: for example, by having him copy words from books—either classic or popular, the latter including comics. Some will say that going from classics to comics is going from the sublime to the ridiculous. But judging from the large amount of shekels expended by parents every year (32,000,000 comics are sold weekly), one might without too wide a stretch of the imagination, say that comics occupy a unique place in young American reading habits. Too, this might be an opportunity to make the comics pay off.

COPYING several pages of Real Life, Superman, and other of the better comics, will rarely expose Johnny to any misspelled words. And many of the words comprise vivid action words that are an asset to anyone's vocabulary. Certainly, such a procedure could stimulate Johnny's wandering interest in spelling.

Or, in addition to the regular quota of weekly spelling words, ten more could be added from the comic-book pages. Undoubtedly, the publishers who have pioneered in using comics as a visual-education aid would co-operate in launching a comic spelling bee! Boards of Education would not have to supply comic books. An appeal for comics from the teacher would result in an avalanche of comic books.

Forty words of a certain number of syllables comparable to the spelling level of a particular grade could be copied and turned into the teacher by each pupil. The teacher could then select forty words from those turned in by the class and give them to the class at the next spelling workshop. They may be

reviewed again during a third twenty-minute spelling period or more — if schools allocate that much time to spelling. And three days a week is not too much to devote to spelling in a junior-high-school course.

FOR those teachers who must be "sold" on the comic-book spelling bee, let them give the comic-book assignment one week and the regular spelling assignment the following week. Comparisons can be made in the results of the two assignments. That the words in the comic books would be learned more quickly than the regular spelling-book ones is not, I think, jumping to too hasty a conclusion.

Of course, precautions would have to be taken to prevent Johnny from spending his spelling time in reading comics. In fact, most of the "comic period" should be spent in writing. Any resourceful teacher who would like to give the idea a spelling whirl can think of better and varied methods for its presentation.

Some will say that teaching spelling with the aid of comic books is going to extremes. But is it as fantastic as spending a whole school week making cheese with a mere fragment of the class participating? Certainly, the old cut-and-dried methods of presenting spelling are not adding to the literacy of our nation —a literacy that didn't show up too well when that great leveler, the Army, pointed out some of the glaring educational defects of its constituents. And I emphasize those glaring educational defects even if a recent poll showed that the great majority of people—many of whom must be parents—are well-satisfied with the education meted out to American youth. How many of those parents who were interviewed had entered a classroom during their son's or daughter's educational years? Just how qualified were they to give an answer that at best could only be snap judgment? Jig-saw puzzles containing the week's spelling words might be put together with advantage and provide another avenue of hope for the poor speller. Working with letters and trying to place them correctly might help him to learn the word for all time—not just for overnight use. Children at all levels like to put puzzles together. Why not capitalize upon this interest by adding puzzles as a visual aid that could be applied to spelling?

THE methods suggested here would be used in a workshop where the child learns the tools of spelling under the watchful eye of the teacher. Let me repeat (and I would like to write it in letters twelve inches high) that in learning new spelling words, let the class be the actual spelling workshop of the child. The spade work done there may help to eliminate a spelling handicap. Spelling homework would be review of words already drilled into the mind of the poor speller. There would be no parrot-like memorizing of forty words overnight—only to be forgotten as easily over another night.

Certainly, it is expedient that we experiment in order to make spelling more attractive to the poor speller in junior-high school. Comics and jig-saw puzzles cannot be any farther astray from the educational mark than many of the current so-called progressive projects. These experiments are visual, and modern instruction is utilizing more and more of visual education—with excellent results.

*Note:* Readers who are interested in Mrs. Malatesta's use of comic books in teaching spelling will find a report of the Stanford University comic-book survey on page 244 of this issue.

## Results of Comic-Book Surveys Reported

Stanford University has announced that Donald Duck and his kindred comedians of the animal cartoon world received an academic "Oscar" from surveys conducted by three Stanford University graduate students into the comic-book reading habits of children in Palo Alto, South San Francisco, and Mountain View junior and senior high schools. The researchers, who reported that comic books are not so harmful as many a harassed parent has supposed, discovered that boys and girls in all three cities rated animal cartoons far above any other comics. No evidence was found to support the oft-heard argument that comic books undermine children's morals, hurt their taste in literature, and are handy traveling equipment on the road to juvenile delinquency.

The California Congress of Parents and Teachers requested, and partially financed, the surveys because it specifically wanted to know how general the habit of comic-book reading is, the basis of comic-book appeal for young readers, and the relationship of comic-book reading to general reading habits, reading ability, intelligence, scholastic achievement, and school citizenship.

The three surveys agreed in the following general conclusions:

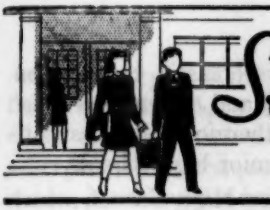
1. Although the habit of comic-book reading is widespread in all of the communities studied, it is not a major time-consuming recreational activity.
2. Animal cartoons and fun and humor books were the favorites in all three cities, with the overwhelming majority of the books read by the students containing little violence, sex, horror, or sadism.
3. In general, students of the least intelligence, poorest scholarship and citizenship, and lowest reading ability read only a few more comic books than those at the superior end of the scale. In none of the categories was there a significant difference in the kinds of comic magazines read by different types of students, and the types of magazines read had no relationship to the general reading preferred.
4. The appeal of the books in all three communities was found to be the children's liking for the animal characters, the lively and humorous adventures of comic-book characters, and such factors as slapstick comedy, lively action, and pictorial presentation.
5. Boys spend more time than girls in reading comic books and are slower to lose the habit. Both boys and girls read fewer comic magazines as they progress through the school grades.

Students in Palo Alto, a college community, generally read fewer comic books than did those in South San Francisco, an industrial city, or Mountain View, a rural community.

In South San Francisco, 11 per cent of the students in the junior and senior high schools said they read no comic books at all; 50.9 per cent said they read 1-4 comic books a week; 30.4 per cent, 5-15 books; 5.6 per cent, 16-25 books; and 2.1 per cent, over 26 books. The Mountain View averages were almost identical.

In Palo Alto, however, 43 per cent of the students said they read less than a comic book a week; 26 per cent indicated from 1-2 comic books as their weekly stint; 16 per cent, 3-4 comic books a week; and 15 per cent, 5 or more a week. To Palo Alto students, though, went the top comic-book readership championship—two seventh-grade boys and one ninth-grade girl indicating they read 50 comic books a week.

One of the researchers concluded: "Those who would eradicate this relatively harmless form of recreation should be prepared to supply a more constructive pastime before they take definite action."



# Secondary Sketches

Edited by EVERETT V. O'ROURKE

**Radio Education in Santa Maria High School and Junior College.**—Radio broadcasting as a credit subject was first offered in the Santa Maria High School and Junior College three years ago; but it was not until the 1946-47 school year, that the course was fully developed and a radio workshop was organized. At present, two full-credit courses are offered each semester to both high-school and college students. Some of the objectives of the courses are: to develop within the student an understanding of the significance of radio and speech training; to prepare students to use radio as a means of self-improvement in oral and written speech; to aid students to train for future employment with radio stations, radio businesses, or school radio stations; and to communicate by means of school broadcasts important phases of the work being offered in the school.

The radio workshop is the center of all radio-broadcasting activity in the school. Students registered in the radio classes comprise the radio-workshop membership and are active in class production over radio stations KCOY, KRJM, and KSMA. Radio-workshop programs are presented each Wednesday from 7:30 to 8:00 p. m., and the school newscasts are given on Thursdays from 5:05 to 5:15 p. m. All of the broadcasts are presented by remote control. Therefore, a remote line is connected to the radio stations from the high-school auditorium, to the radio workshop, and to the stadium, where the football games are broadcast each season.

Radio awards, based on a point system, are given each year to students who have excelled in the various fields of radio broadcasting.

Students trained in this work develop skills in techniques of radio broadcasting and secure the basic characteristics of a general education. Many are able to complete the elementary training for professional radio.

* * *

**The Junior-High-School Program in San Jose.**—The democratic philosophy which characterizes the administration of the San Jose school system has made it possible for each junior high school to develop its own individuality through procedures and policies best-adapted to the needs of the students and their school community. Education for citizenship is the all-embracing objective of the entire program. Practice in democratic living is provided in homeroom, classroom, and extracurricular activities, and the type of student government adopted by each school varies according to the interests and the needs of the group.

Students are classified, for instruction purposes, according to ability. In order to provide for individual differences, the program is made as flexible as possible. Constant attention is given to improving curriculum content. For example, through the use of contemporary materials in a unit on "Motion Picture Evaluation," the students in one school are guided to learn to make critical and appreciative discrimination between good and poor pictures.

The guidance program, directed and co-ordinated by an administrative counselor in each school, functions through the homeroom and the various departments of the school and is a major responsibility of each teacher. Very effective counseling is being done during homeroom discussions on human relations, the art of getting along with others.

A basic, district-wide program of English, mathematics, social studies, and physical education and health is required of each student in Grades 7 to 9. Such subjects as art, music, shop, homemaking, and science are offered as shorter courses. They provide an opportunity for exploration and development of interests and skills in the fields of the practical and the fine arts. In the ninth grade, these and other courses are offered as electives.

In some schools, a daily activity period is provided before regular classes begin. During this period, special music groups meet, and various worth-while student activities are carried on. Remedial classes in spelling, penmanship, reading, and mathematics provide help for students who need it. If students have missed work because of absence or for other reasons, they are urged to take advantage of this opportunity to receive special help from their subject teachers.

The philosophy which guides the policies and procedures of the junior-high-school program in San Jose is based on faculty, administration, and parental understanding of the needs of children of the early and middle adolescent years, according to Marguerite Shannon, Principal, Herbert Hoover Junior High School.

* * *

**Football at Ventura Junior High School.**—Regular eleven-man football for junior-high-school students has been criticized as being too rough for boys of this age. This objection particularly applies to interscholastic competition. Six-man football and eleven-man touch football have, therefore, been substituted in most junior high schools.

Ventura Junior High School, which comprises grades seven through ten, has worked out a plan for regular football which eliminates these criticisms, according to Principal Ogden. Every ninth- and tenth-grade boy who is able and wants to play has an opportunity to do so. The plan protects him with proper equipment in equal competition, and keeps the game, for the most part, within the confines of the school.

In the spring, every boy who wants to play football is placed on a list and programmed in the fall for the last period of the day. Each boy is given a thorough physical examination and classified according to C. I. F. exponents. Boys are then divided into lightweight and heavyweight teams. Captains and co-captains are selected from among student leaders; and they, in turn, select team members. Names are chosen for teams, such as "Trojans," "Bears," and "Bruins." Each team member is outfitted with complete football equipment, and teams are distinguished by different-colored jerseys.

After setting-up exercises and two weeks of fundamentals have been completed, a regular round-robin of games is run off.

This year there were ten teams—four lightweights and six heavyweights. Each team, within its own class, played one full-length game each week for a period of five weeks. This schedule culminated in a championship for each class.

At the end of the season, after boys were well conditioned, the thirty-five best boys in the heavyweight class were placed on a so-called "varsity" team and allowed to play four games with sophomore and high-school teams from other schools.

The finest part of the program was the leadership developed among the boys. Once they were selected, captains and co-captains had complete charge of the teams, including conditioning exercises, coaching of plays, discipline of players, making substitutions in games, and calling plays. In other words, the game was "given back" to 160 boys, and they liked it, while learning to work and play together. The effect upon the boys' conduct in school, as a result of this program, has been most noticeable. There has been no evidence of additional desire for competitive athletics.

Similar programs will be followed in basketball and softball, as the year progresses.

* * *

**Functional Use of the Activity Period.**—Woodrow Wilson High School in Long Beach operates on a seven-period day, following a fifteen-minute homeroom or section meeting the first thing in the morning. (The class periods are fifty minutes in length, exclusive of passing time.)

One period a day is set aside to provide opportunity within the regular school day for club, class, and student-council meetings and for the numerous other extracurricular affairs in which high-school students engage.

To be specific, on Mondays, first-period classes are dropped in favor of activities. First-period classes, therefore, meet only four times a week for a weekly total of 200 minutes. On Tuesdays, the second-period classes give way to activities and, consequently, meet only four days a week for a total of 200 minutes. Wednesdays, the activities take a period from third-period classes; on Thursdays, the activities are scheduled during sixth period; and on Fridays, during seventh period.

To avoid conflicts or overlapping, a general plan is followed. Meetings of class groups are limited to Mondays; club meetings have the right-of-way on Tuesdays; auditorium assemblies, required and voluntary, are held on Wednesdays and Thursdays. This schedule was planned purposely in order to have the activity period fall on the last period of the day on Fridays, thereby making it possible for both members of athletic teams and spectators to participate in scheduled games without breaking into the regular scheduled program.

On days when a required assembly is not held during the activity period, students are urged to avail themselves of the opportunity to: (1) confer with teachers of subjects in which they may be having difficulty, (2) make use of the library for reference or recreational reading, (3) report to classrooms and laboratories to put in time on work they may wish to pursue, and (4) to work on projects in shops or in art and homemaking rooms—or to plan new ones.

Under this plan, according to Principal Martin, it is possible to carry forward a great variety of desirable activities with a minimum of interruption of the regular schedule.

* * *

**Reading in John Burroughs Junior High School.**—"In Burbank every effort is being made to meet the reading needs of all boys and girls at each level of development," writes Miss Arline Dunne, Social Living Co-ordinator of John Burroughs Junior High School. The planned-reading instruction does not end with the elementary schools. Pupils are given standardized tests in the sixth grade and are guided into the proper classes for reading instruction when they enter 7B. This program has been in operation for the past four years.

Two semesters of reading are required for all students in the junior high schools. These are spaced apart if possible—one semester in the seventh grade

and one semester in the eighth grade. At both grade levels the classes are grouped according to their needs, with materials chosen to fit the abilities of each group.

A class of accelerated readers spends more time on literature, individual library study, and creative writing, although they review and improve all reading skills.

The larger group with average reading ability divides its time between working to improve skills and reading for interest and enjoyment. Such a typical seventh-grade group makes good use of *Driving the Reading Road,* the state reader.

Children for whom reading is difficult have the opportunity of being taught in small groups, averaging fifteen to a class. This means they can receive twice as much help from their teacher. Great care has been taken to select proper reading materials with interest for the junior-high student. A careful check is kept of each child's progress, and clinical help is given when necessary.

The reading program throughout the junior high school is no longer a haphazard affair, but has been planned to meet the peculiar needs of the individual student it serves.

* * *

**Have You Tried Posture Silhouettes?**—"For three years an extensive preventive and corrective posture program has been a part of the girls' physical education department at the Oakdale Joint Union High School," writes Miss Gladys Whitney, girls' physical education instructor of the school.

Shortly after a girl enters Oakdale High School, two silhouettes are taken of her natural standing posture—a side view and a back view. The pictures are printed and mounted on cards. Individual interviews are arranged for each girl, during which time her pictures are studied and counsel is offered. Subsequent silhouettes are taken and interviews are arranged if necessary. All girls have pictures retaken as seniors in order to demonstrate improvement in posture.

The pictures are taken with a 35-mm. camera. The subject stands against a screen, behind which are two No. 2 photoflood lamps in reflectors. The screen consists of light-weight canvas, hung over a doorway. The camera is placed 12 feet from the screen and the photofloods are about 12 feet behind the screen, reflecting the light onto the screen from both sides of the room, at about a 45-degree angle. The camera and subject are in darkness. Each girl is given a different number, which is made out of heavy cardboard and pinned to the screen for identification. Miss Whitney has found that, for best results, girls should be unclothed or should wear as little as possible.

Miss Whitney is using her own equipment to save expense. She has found that a special room is not necessary—equipment rooms, towel rooms, small halls, or offices can usually be used.

The main values, as Miss Whitney sees them, in this type of program are:

1. It starts with the girl as she is and helps her to progress from that point.

2. There is real interest in improvement because the girl can see her own shortcomings.

3. All girls, not merely those with the poorest postures, derive benefit.

4. Special equipment and special rooms are seldom necessary.

5. Each girl can continue with regular physical education activities, inasmuch as it is not necessary for her to be assigned to corrective classes only.

# Summer Sessions at Universities In California

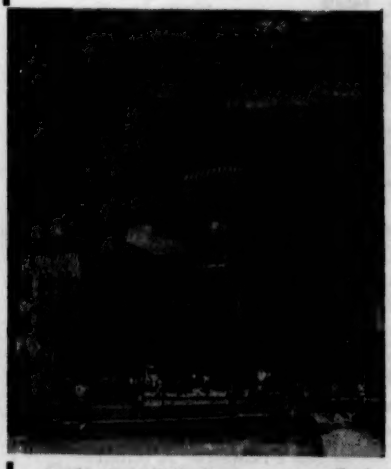
## University of Southern California

### 1948 Summer Session

The 1948 Summer Session of the University of Southern California offers its usual wide variety of courses in all departments of the University. Of particular interest this summer is the range of offerings in Art and Music, English and History, and Physical Education. In addition to the regular courses in Education, there are the following special features:

1. Graduate-professional courses in Industrial-Arts Education and in Business Education.
2. Workshop in Intercultural Education, under the direction of Mrs. Jane Hood, assisted by Professor E. Franklin Frazier, Professor and Head of the Department of Sociology, Howard University, and 1948 President of the American Sociological Society; Mrs. Sybil Richardson, Co-ordinator in the Division of Research and Guidance of the Los Angeles County Schools; and Professor Edward C. McDonagh.
3. Workshop in Reading under the direction of Professor Nila B. Smith.
4. Courses in Family-Life Education to be taught by Frances Bruce Strain, noted lecturer and consultant in sex education.
5. Summer Radio Workshop conducted by A. B. C., C. B. S., M. B. S., and N. B. C. personnel.


# *Summer Session*



Special opportunities are offered in the fields of Art, Music, Drama, Audio-Visual Education, Remedial Reading, Speech Correction, School Administration, Counseling and Guidance, Intercultural Education, Family Life Education.

*Reduced rates for teachers in active service*

**SIX WEEKS—June 21 to July 31**
**FOUR WEEKS—Aug. 2 to Aug. 28**
**TEN WEEKS—June 21 to Aug. 28**

Students will find numerous offerings in the Graduate School, in the College of Letters, Arts, and Sciences, in the Colleges of Architecture, Commerce and Business Administration, Engineering, Music, and Pharmacy; in the Schools of Education, Journalism, Library Science, Public Administration, Religion, and Social Work, and in the departments of Occupational Therapy, Physical Therapy, Radio, and Cinema.

***Write for Summer Session Bulletin***

**THE UNIVERSITY OF SOUTHERN CALIFORNIA**

**LOS ANGELES 7, CALIFORNIA**

The Summer Session will include courses for teachers who are serving on emergency credentials and for persons who wish to teach temporarily in order to help relieve the present shortage of teachers. Special opportunities will be provided in curriculum-laboratory work, audio-visual education, counseling and guidance, and school administration. There will also be special instruction for those working in remedial reading, speech correction, and the conservation and improvement of hearing.

The regular staff of the University will be augmented by a number of visiting professors, some of whom are: Margery Bailey, Associate Professor of English, Stanford University; M. Lynn Bennion, Superintendent of Schools, Salt Lake City; John Cavanna, Assistant Professor of English, Polytechnic Institute of Brooklyn; Edgar H. Duncan, Associate Professor of English, Vanderbilt University; W. Stull Holt, Professor and Head of the Department of History, University of Washington; Karl J. Holzknecht, Professor of English in the Graduate School, Washington Square College, New York University; John La Monte, Professor of Medieval History, University of Pennsylvania; Ralph Lutz, Professor of History, Dean of Graduate Study, and member of the Council of the Hoover Institute and Library, Stanford University; James Mulhern, Professor of Education, University of Pennsylvania; S. L. Pressey, Professor of Psychology, Ohio State University; Joseph S. Roucek, Chairman and Professor of Sociology, Hofstra College; George D. Strayer, Associate Professor of Education, Indiana University; Harvey Wish, Associate Professor of History, Western Reserve University; and Karl With, Professor of Art, Hamilton College.

Six-Week Session: June 21 to July 31
Four Week Postsession: August 2 to August 28
Ten-Week Session: June 21 to August 28

●

## Summer Session at Mills College

### July 3 to August 14, 1948

Eleven programs of study will be offered during the Mills College Summer Session, July 3 to August 14, which is open to both men and women.

The language houses—*Casa Panamericana, La Maison Française,* and the English Language Institute—will again be in session, as will the programs of the United States, the Creative Art Workshop, Child Development, Drama, Music, and Theatre. New programs to be offered are a Kindergarten Workshop and a workshop in Counseling and Guidance.

Mills will have as its guests in *The United States House,* Professor Dennis W. Brogan of Cambridge University and Mrs. Vera Dean, Research Director, Foreign Policy Association. Dr. Brogan's study of the "American Character" has received much favorable attention on both sides of the Atlantic. Professor Arturo Torres-Rioseco, Chilean scholar and now at the University of California, will be visiting professor in *Casa Panamericana, La Maison Française,* for the study of French language and culture, will have among its staff several visitors from France. Nationally-recognized authorities will instruct in all programs.

The Paganini String Quartet will be in residence and will provide the annual summer series of concerts—six on the campus and six in San Francisco. A Kindergarten Workshop will be held this summer for the first time, as a regular program of the Mills College Summer Session. The sessions, under the direction of Mrs. Persis H. Cowan, Chairman of the Department of Education, will be held at the John Swett Elementary School near the Mills campus. The daily program for the six weeks will consist of lectures and discussions dealing with the growth and the development of four- and five-year-olds and a kindergarten program covering such phases as parent relations, materials of instruction, and equipment.

Observations of kindergarten groups and of two- to four-year-olds in the Mills Children's School, as well as field trips to analyze community resources, will be

included. A workshop in art, music, games, rhythms, and children's literature will also be part of the new course.

The Summer Session also emphasizes early childhood education with opportunity for directed teaching in the nursery school. Related courses in various aspects of growth and development are of interest to parents and to the general student, as well as to the professional worker with children. The Children's School admits boys and girls two to seven years of age.

The Workshop in Counseling and Guidance is designed to meet the need of students who have a professional interest in the field and for those with a general interest in counseling young people. It will offer a basic program for those who wish to qualify for such positions as dean of men or women, director of residence, and other personnel officers in schools and colleges and youth-serving agencies.

The first unit will consider the philosophy and the techniques of personnel work. It will include a discussion of the uses of tests in counseling, the development and use of a cumulative personal record, as well as some study of other techniques such as the interview, rating scales, and projective techniques.

The second unit will be concerned with the work of the high-school dean or counselor and will include discussions of problems of organization and administration of a high-school personnel program.

The third unit will be directed at the college level. It will take up problems and programs of admission and orientation; values of extracurricular activities; and social and emotional development through participation in group life.

*Casa Panamericana,* in its eighth summer on the Mills campus, offers graded study of the Spanish and Portuguese languages and courses on the culture of the Latin-American countries and peoples. Luis Monguió, Assistant Professor of Romance languages at the College, is chairman of the summer language house.

A workshop for teachers of social sciences and of the Spanish and Portuguese languages will be offered in *Casa Panamericana.* Designed for teachers interested in introducing or fitting Latin-American materials into their school curricula or community-activity programs, the workshop will consist of general meetings, individual conferences, selected individual projects, and discussions with members of the staff of *Casa Panamericana.* The program offers two or more graduate units of study.

*La Maison Française* (where French only is spoken) will offer courses in phonetics, diction, grammar, translation, literature, and civilization.

Parallel to the enterprises in acquaintance with foreign languages and cultures, Mills College offers the United States House for the study of our own national tradition and problems, with special emphasis upon twentieth-century life. Courses will include American history; literature; social, economic, and international problems. They are designed to serve students and teachers both of English and of the social sciences.

The English Language Institute offers an intensive course for foreign students

**MILLS COLLEGE**

**1948 SUMMER SESSION • 3 JULY—14 AUGUST**

*(For Men and Women—resident and non-resident)*

**— PROGRAMS —**

| | |
|---|---|
| *Casa Panamericana* | *La Maison Francaise* |
| Child Development | Music |
| Creative Art Workshop—including children's classes | Theatre—including children's classes |
| English Language Institute | The United States House |
| Kindergarten Workshop | Workshop in Counseling and Guidance |

**Inclusive Fee: registration, tuition, board and room, health services and incidentals.....$250.00**

*Write to:*

**OFFICE OF THE SUMMER SESSION**
**MILLS COLLEGE, OAKLAND 13, CALIF.**

desiring to improve their conversational English and conducts a workshop for teachers of English as a second language. Practice opportunities will be afforded in the instruction of Latin-American groups in the vicinity.

In the Creative Art Workshop, instruction is offered in the techniques of painting, drawing, weaving, and ceramics.

●

## University of California at Berkeley

### June 21 to July 31

### August 2 to September 11

The University of California, Berkeley campus, will hold two Summer Sessions of six weeks each—the first one from June 21 to July 31 and the second from August 2 to September 11. Visitors from many cities in the United States and Canada, specialists in their fields, will augment the regular staff of the Department of Education in the offering of courses of interest to secondary-school teachers and administrators.

There will be the general history and theory upper-division courses, followed by educational psychology; statistical methods in education; psychology of high-school subjects; standard tests in education (a critical survey and evaluation of standard tests, including achievement and psychological tests available for school purposes), practice in giving and scoring tests and interpreting results for the improvement of instruction, and the organization of a testing program; administration of city and state school systems; problems in public-school finance and business administration; and public education in California.


# UNIVERSITY OF CALIFORNIA SUMMER SESSIONS

*At Berkeley*

To be held on the BERKELEY, the LOS ANGELES and the SANTA BARBARA campuses, the University of California Summer Sessions, with a wide variety of courses, will stress all phases of teacher training.

*At Los Angeles*

*At Santa Barbara*

For Bulletins, address Summer Sessions Office, Berkeley 4, or Los Angeles 24, or Santa Barbara, California.

1ST SUMMER SESSION:
Six Weeks — June 21 to July 31

2ND SUMMER SESSION:
Six Weeks — August 2 to September 11

A course entitled Introductional Materials and Equipment will be made available to the classroom teacher, demonstrating the latest methods in audiovisual and radio aids in teaching.

Two courses will be open to persons whose work is in the field of child welfare—one course entitled "Laws Relating to Children" and the second, "Supervision of Child Welfare and Attendance."

Graduate courses are listed in research techniques, covering research problems in education, historical, and scientific methods, design of investigations, bibliographical techniques, statistical methods, survey methods, and laboratory techniques and methods of reporting results. Other graduate courses listed are in educational psychology; experimental education, which includes in its study voice recording, photographing eye-movements in reading and spelling, analysis of rhythm in reading, arithmetic, and writing.

A workshop for teachers, principals, and superintendents who wish to make specific plans and develop materials for specific curriculum problems in their schools will be found in the course Problems in Curriculum Development.

Problems in schoolhousing; school surveys; secondary-school curriculum; techniques of curriculum making; recent developments in teaching English literature and composition in secondary schools—these subjects will also be listed among the courses to be offered during the Summer Sessions.

A group of special-education courses will be given, covering speech disorders, clinical practice in speech therapy, English phonetics with special reference to speech improvement, phonetics applied to the correction of articulatory speech defects, and educational treatment of cerebral palsied children.

Further information concerning courses in education or other departmental offerings in 1948 may be obtained by writing to the Office of the Summer Sessions, University of California, Berkeley 4.

*We Have*

**Teachers for Positions**

*as well as*

**Positions for Teachers**

**OUR EXPANDED FACILITIES**

*COUPLED WITH THIRTY-EIGHT YEARS OF PLACEMENT EXPERIENCE MAKE IT POSSIBLE TO SERVE THE PROFESSION BETTER THAN EVER BEFORE.*

**Kemp Agency**

*J. M. KEMP, Manager*

681 Market Street Phone: GArfield 1-7024

SAN FRANCISCO 5, CALIFORNIA

Of Interest to Teachers and Counselors

**OCCUPATIONS**

TEXT — NOTEBOOKS

By R. Floyd Cromwell and M. D. Parmenter

**YOU AND YOUR FUTURE**
**EXPLORING OCCUPATIONS**
**SUCCESS IN THE WORLD OF WORK**

These three units may be used effectively for group work in guidance in secondary schools.

Single Copy $0.40. Fifty or More, Any Assortment, $0.36 each.

Teacher's Manual $0.10

Prices include transportation charges

**THE PSYCHOLOGICAL CORP.**

522 Fifth Ave. New York 18, N. Y.

# LEDERER, STREET & ZEUS COMPANY

*Outstanding Service in the Designing and Printing of School and College Yearbooks*

●

**2121 ALLSTON WAY • BERKELEY 4, CALIFORNIA**

*Publication Printers*

★

## The James H. Barry Company

170 SOUTH VAN NESS AVENUE
SAN FRANCISCO, CALIFORNIA
TELEPHONE UNDERHILL 1-7780

# CALIFORNIA SOCIETY OF SECONDARY EDUCATION

INCORPORATED UNDER THE LAWS OF CALIFORNIA AS A NON-PROFIT ORGANIZATION

## OFFICERS

EDWARD H. REDFORD.....*President*
H. M. MCPHERSON.....*First Vice-President*
WILLIAM R. ODELL.....*Second Vice-President*
LILLIAN M. PERRY.....*Secretary*

*Office Address:* Rooms 9-10, Haviland Hall, Berkeley, California

## EXECUTIVE BOARD

HAROLD B. BROOKS
ROBERT R. HARTZELL
H. B. MCDANIEL
WILLIAM R. ODELL
H. M. MCPHERSON *(ex officio)*
EDWARD H. REDFORD *(ex officio)*

## BOARD OF TRUSTEES

ETHEL PERCY ANDRUS, Vista.

A. C. ARGO, District Superintendent, Sequoia Union High School, Redwood City.

JOHN ASELTINE, Principal, San Diego Senior High School, San Diego.

J. WARREN AYER, Monrovia.

GEORGE J. BADURA, Principal, Fortuna Union High School, Fortuna.

A. JOHN BARTKY, Dean, School of Education, Stanford University.

MARGARET BENNETT, Director, Education for Women, Pasadena City Schools.

GRACE V. BIRD, Director, Bakersfield Junior College, Bakersfield.

JESSE A. BOND, Associate Professor of Education, University of California, Los Angeles.

HAROLD B. BROOKS, Principal, George Washington Junior High School, Long Beach.

A. J. CLOUD, President, San Francisco Junior College, San Francisco.

AUBREY A. DOUGLASS, Associate Superintendent of Public Instruction and Chief of Division of Teacher Education, State Department of Education, Sacramento.

HIRAM W. EDWARDS, Director, Office of Relations with Schools, University of California.

L. P. FARRIS, Oakland.

GEORGE H. GEYER, State Director, State and Regional Survey Directors, State Department of Education, Sacramento.

STANFORD HANNAH, District Superintendent, Jefferson Union High School District, Daly City.

JOHN W. HARBESON, Principal, Pasadena Junior College, Pasadena.

ROBERT R. HARTZELL, District Superintendent, Red Bluff Union High School, Red Bluff.

WALTER R. HEPNER, President, San Diego State College, San Diego.

GEORGE C. JENSEN, Sacramento.

H. B. MCDANIEL, Associate Professor, School of Education, Stanford University.

HARRY M. MCPHERSON, District Superintendent, Napa Union High School District, Napa.

WILLIAM R. ODELL, Superintendent of Schools, Oakland.

EDWARD H. REDFORD, Co-ordinator, Adult Education, San Francisco Public Schools.

CORNELIUS H. SIEMENS, Director, Compton College, Compton.

HERMAN A. SPINDT, Admissions Director, University of California.

FRANK W. THOMAS, President, State College, Fresno.

C. C. TRILLINGHAM, County Superintendent of Schools, Los Angeles.

FLAUD C. WOOTON, Associate Professor of Education, University of California, Los Angeles.

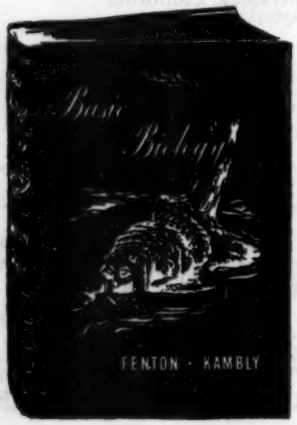
## EX-OFFICIO HONORARY MEMBERS OF BOARD OF TRUSTEES

ROY E. SIMPSON.....State Superintendent of Public Instruction
FRANK B. LINDSAY, Assistant Superintendent of Public Instruction, State Dept. of Education

# TWO NEW SCIENCE LEADERS —

## BASIC BIOLOGY

**FENTON *and* KAMBLY**




Observational approach, real training in the scientific method.

Coherent organization, to simplify the study of biology.

Suitability for either college preparatory or non-college groups.

Coverage of all principles agreed upon as essential to one-year course in state or city syllabi.

*WORKBOOK-LABORATORY MANUAL*
*now available*

## BASIC CHEMISTRY

**BAYLES *and* MILLS**

Reflective-study method of approach.

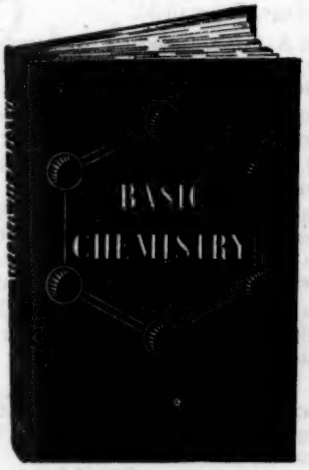
Coherence of development and harmonization of concepts.

Early introduction to colloidal chemistry and to subatomic structure of matter.

Emphasis on organic chemistry.

Use of Meggers 1947 Periodic Table.

*LABORATORY MANUAL and TEACHERS' MANUAL now available*




OUR TEACHERS MUST
OUR NATION'S FUTURE

## THE MACMILLAN COMPANY

**350 Mission Street • San Francisco 16**